"EFFICACY OF 3% HYPERTONIC SALINE ALONG WITH SALBUTAMOL IN ACUTE WHEEZING IN CHILDREN AGED 2—6 YEARS ATTENDING A TERTIARY CARE HOSPITAL".

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CHENNAI

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INSTITUTE OF CHILD HEALTH AND HOSPITAL FOR CHILDREN
MADRAS MEDICAL COLLEGE
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CERTIFICATE

This is to certify that the dissertation titled **"EFFICACY OF 3 % HYPERTONIC SALINE WITH SALBUTAMOL IN ACUTE WHEEZING IN CHILDREN AGED 2—6 YEARS ATTENDING A TERTIARY CARE HOSPITAL"** submitted by DR.B.THIRUMOORTHY to the faculty of, pediatrics. The Tamilnadu DR.M.G.R Medical University, Chennai in partial fulfillment of the requirement of for the award of M.D DEGREE (PAEDIATRICS) is a bonafide research work carried out by him under direct supervision and guidance.

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I DR.B.THIRUMOORTHY, solemnly declare that the dissertation titled "EFFICACY OF 3% HYPERTONIC SALINE WITH SALBUTAMOL IN ACUTE WHEEZING IN CHILDREN AGED 2—6 YEARS ATTENDING A TERTIARYCARE HOSPITAL" has been prepared by me.

This is submitted to the Tamilnadu DR.M.G.R Medical University, in partial fulfillment of the rules and regulations for the M.D Degree examination in pediatrics.

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TABLE OF CONTENTS

S.NO.	TOPIC	PAGE
1.	INTRODUCTION	**1**
2.	REVIEW OF LITERATURE	**29**
3.	STUDY JUSTIFICATION	**35**
4.	OBJECTIVES	**36**
5.	METHODOLOGY	**37**
6.	RESULTS & ANALYSIS	**50**
7.	DISCUSSION	**101**
8.	LIMITATIONS	**104**
9.	RECOMMENDATION	**105**
10.	CONCLUSION	**106**
11.	BIBLIOGRAPHY	**107**
	ANNEXURES 1. INFORMED CONSET FORM 2. INFORMATION SHEET 3. PROFORMA 4. PLAGIARISM CERTIFICATES 5. MASTER CHART	**112**

INSTITUTIONAL ETHICS COMMITTEE
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CERTIFICATE OF APPROVAL

To

Dr.B.Thirumoorthy,
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Dear **Dr.B.Thirumoorthy,**

The Institutional Ethics Committee of Madras Medical College, reviewed and discussed your application for approval of the proposal entitled "**Efficacy of 3% Hypertonic Saline with salbutamol in acute wheezing in children aged 2 to 6 years attending a tertiary care hospital**" No.12032014.

The following members of Ethics Committee were present in the meeting held on 11.03.2014 conducted at Madras Medical College, Chennai-3.

1.	Dr. C.Rajendran, M.D,	-- Chairperson
2.	Dr.R.Vimala, MD., Dean, MMC, Ch-3.	-- Deputy Chairperson
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9.	Thiru.S.Ramesh Kumar, Administrative Officer, MMC, Ch-3.	-- Lay Person

We approve the proposal to be conducted in its presented form.

Sd/Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

13/3/14

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ABSTRACT

BACKGROUND

Defective mucociliary clearance due to dehydration of airway surface liquid is proposed to be main reason for prolonged hospital stay and increased severity of symptoms in children with acute wheezing episodes due to viral infections. These episodes are most commonly due to Rhino viral infections. This study was undertaken to determine whether nebulization of 3% hypertonic saline with salbutamol decreases the hospital admission rate and clinical severity score in these children with acute wheezing episodes.

METHODOLOGY

This clinical trial was conducted in the casualty of INSTITUTE OF CHILD HEALTH , EGMORE, from March 2014 to September 2014.In our study 114 children between 2-6 years of age who presented to our hospital with acute wheezing episodes were included according to inclusion criteria. Out of 114 children 14 children were excluded with exclusion criteria .Patient details were filled in standard proforma and asthma clinical scoring was done. These children alternatively had given normal saline with salbutamol and 3% hypertonic saline

with salbutamol along with oxygen 3 times with 20 minutes interval. Post nebulization scoring and admission rate were noted.

RESULTS

At the end of the study we found out of 29 (58%) children in 3% Hypertonic saline group have been admitted as against 41(82%) children in normal saline group with a p value of 0.009 which is significant. 22 (44%) children in 3% Hypertonic saline group had a clinical severity score of less than 6 and 28 (56%) children had clinical severity score of more than 6 with a p value of 0.010 which is significant. The risk difference in admission rate was 24% with a 95 % confidence interval of 6 to 40 %.

DISCUSSION

Clinical improvement caused by 3% hypertonic saline with salbutamol nebulization as evidenced by decrease in admission rate and improvement in asthma clinical severity score is in line with previous similar studies.

CONCLUSION

3% hypertonic saline along with salbutamol has significantly reduced the hospital admission rate and clinical severity score in children with acute wheezing episodes due to viral infections.

KEY WORDS---Acute wheezing-preschool children-airway surface liquid-mucociliary clearance.

INTRODUCTION

DEFINITION:

Wheeze is defined as a musical sound which is continuous and originates from oscillations in the narrowed airways. Wheezing is mostly heard during expiration due to critical narrowing of airways.

Polyphonic wheezing occurs due to widespread narrowing of airways that leads to various levels (or) pitches that is typically seen in bronchial asthma. Monophonic wheezing is usually produced in expiration and is single pitched. It occurs in conditions like Bronchomalacia and in distal tracheomalacia. Stridor is produced in inspiration and the obstruction is usually in extra thoracic airways. The airflow obstructions in airways are affected by the airway caliber and compliance of the lung.

Airway resistance in the tube is inversely related to the radius of the tube to the fourth power. In most of the children aged less than 5 years of age, the small diameter of the peripheral airways can lead to 50% of airway resistance. In these children an acute viral infection can lead to increased mucous secretion, inflammation and associated broncho constriction leading to acute wheezing episodes[1].

Bronchiolitis which occurs in children less than 2 years of age is due to respiratory syncytial virus. The increased severity of the respiratory syncytial virus during early infancy is due to presence of passively transferred maternal antibodies. The virus causes milder form of disease in older children.[2]

The viral induced upper and lower respiratory tract infections are the most common cause for acute wheezing episodes and admission in hospital and development of asthma in later age. The most common pathogens are Human rhino virus, Respiratory syncytial virus, Human meta pneumo virus (HMPV), .Human Para influenza virus (HPIV),Entero virus(EV), Influenza virus(INFV), Adeno viruses and Human Boca viruses. In the above viruses Human rhino virus, respiratory syncytial virus, Human Para influenza viruses are most commonly responsible for inducing acute wheezing episodes in children. These viruses were also responsible for exacerbation of asthma in children as well as in adults. In recent studies it was proved that respiratory syncytial virus is the most common virus that is responsible for 50% of acute wheezing episodes in infants.[2]

In recent studies it has been revealed that rhino viruses in the lower respiratory tract causes fluid and electrolyte movement across the luminal surface of the epithelial cells of the respiratory tract. These rhino viral

infections increase extra cellular adenosine tri phosphatase levels which leads to decrease in extra cellular adenosine tri phosphate levels (ATP). This decrease in adenosine tri phosphate levels leads to decrease in chloride secretion and increase in the levels of sodium absorption from airway surface liquid.

Water is transported from airway surface liquid in to the mucosa along with electrolytes. This leads to dehydration of airway surface liquid and edema of sub mucosa and adventitia. These viral infections also cause increased mucous secretions and epithelial sloughing. They also lead to mucous plug formation. From above details it is clear that these viral infections by causing airway surface liquid dehydration causes failure of mucous clearance.[3]

AIRWAY SURFACE LIQUID[4]

The airway surface liquid is a thin layer of fluid, which covers the lumen of airways has a protective role of the airway epithelial cells from dehydration , inhaled particles, pathogenic organisms like bacteria's and viruses.

The airway surface liquid has two layers:

1. Gel or mucous layer which floats over sol layer.

2. Watery peri ciliary or sol layer.

The exact volume and composition of these layers are still correctly not known.

The airway surface liquid is regulated by ionic transport processes across airway epithelium.

These two transport mechanisms are:[5]

1. Sodium absorption.

2. Chloride secretion.

So the proper function of airway surface liquid is necessary for the optimal function of mucociliary clearance, this in turn prevents retention of mucous and inhaled particles either organic or inorganic. Defective mucociliary clearances are the main predisposing factors for the pathogenesis of a number of chronic respiratory problems. There are number of therapies aimed at removing these accumulated mucous from airways.

Chest physiotherapy is an example of physical removal of these retained secretions. It is highly effective, but expensive and time consuming. Pharmacotherapy which aims to enhance mucociliary clearance from airways includes mainly two agents, nebulized hypertonic saline, and nebulized mannitol. Inhalation of six percent hypertonic saline

with 10ml volume has dramatically improved symptoms of patients with cystic fibrosis.

Also the mannitol when given as aerosol from nebulizer improved the mucociliary clearance in cystic fibrosis patients and bronchiectasis.

MECHANISM OF ACTION:[6,7,8]

Classification of muco active agents,

- Mucolytic
- Expectorants
- Mucokinetics
- Ion transport modifiers
- Other muco regulatory agents.

As far as hypertonic saline is concerned it cannot be fitted into the group of muco active agents because of its multiple mechanisms of actions. Mucolytic agents disintegrate the structure of mucus and decrease its viscosity and elasticity. So the main aim of any mucolytic agent is to decrease the viscoelasticity of the airway secretions to facilitate their clearance from the airways.[9]

Even though hypertonic saline is not a mucolytic agent it is capable of disintegrating the ionic bonds within the mucous gel and decreasing cross linkage entanglements. Also hypertonic saline disintegrates the

DNA from the mucoprotein, which in turn allows the natural proteolytic enzymes to digest the mucoprotein.[10,11,12]

Hypertonic saline markedly increases the depth of liquid layer in the airway surface liquid by attaching to it. Hypertonic saline being an osmotic agent draws liquid into airway surface liquid from epithelial cells. Degree of restoration of the airway surface liquid varies depending upon the dose of hypertonic saline given locally as nebulization. The level of hypertonic saline reaches its high peak level temporarily and returns close to its pretreatment levels in about 10mts.Hypertonic saline also triggers cough , which improves cough mediated clearance by decreasing mucous adhesivity.[13]

Recently hypertonic saline appears to increase the levels of two thiols.[3]

- Glutathione
- Thiocyanate

Present in the airway surface liquid which has a protective effect against oxidation injury, which causes airway inflammation and release of neutrophils, eosinophil , mast cells, basophils and pro inflammatory mediators which in turn leads to edema, decreased mucociliary clearance, increased mucous production and chronic obstructive airway disease.

PRE SCOOL WHEEZING - ACUTE WHEEZING IN 2-6 YEARS OLD

There are several phenotypes involved in recurrent preschool wheezing and it has a variable prognoses and management.

Recurrent preschool wheezing is not synonymous with asthma because of its obvious relation to viral illness, temporal nature and lack of data on underlying inflammatory process. The degree of inflammation varies with different studies.

In some studies neutrophils dominates and in some eosinophil's, and in others no evidence of either.

PHENOTYPES IN PRESCHOOL WHEEZING:-

2 Major phenotypes involved.

1. Virus induced wheezing.
2. Multitrigger wheezing.

VIRAL INDUCED WHEEZING:-

It accounts for about two- thirds of all preschool wheezing. These phenotypes have normal premorbid lung function, intermittent airway obstruction and are asymptomatic between each episode. These children usually have a favorable prognosis. They only need supportive treatment.

Respiratory syncytial virus can produce severe respiratory distress below 2 years of age and may lead to recurrent wheezing episodes in preschool children. Human Meta pneumovirus can also produce recurrent wheezing episodes.

It has been proved that Rhinoviruses can trigger wheezing in early life and may lead to asthma in later life.

MULTITRIGGER WHEEZING:-

It is less common in early years of life, as it is usually caused by allergy. It manifests in preschool years of life.

Family history of asthma and allergy is present with this phenotype. It usually persists beyond early childhood. It is associated with significant deficits in lung function and growth up to 11 years of age.[14]

PATHOGENESIS[15] OF VIRUS INDUCED WHEEZING

After entry and replication the new viral particles are released and cause local and systemic infection. These viral particles recruits ***lymphocytes, monocytes, eosinophil's, basophils*** and releases inflammatory mediators like IL-8 , cytokines, histamine, bradykinin and others.

These inflammatory mediators are responsible for broncho constriction, capillary leak, edema of airway, increased extra cellular ATP ase, stimulation of neural receptors responsible for broncho constriction leading to acute wheezing episodes.

The increase in extra cellular ATP ase in the airway cells causes decrease in extra cellular ATP that leads to dehydration of airway surface liquid due to trans membranous transport of ions like sodium reabsorption chloride secretion.

The dehydration of airway surface liquid along with broncho constriction due to release of inflammatory mediators leads to acute Wheezing attacks that often doesn't respond to bronchodilators.

CLINICAL FEATURES

Affected children will develop malaise, headache, running nose, sneezing, conjuctival congestion, fever, cough, bronchospasms and acute wheezing episodes.

COMPLICATIONS

Complications due to rhino viral infections are uncommon. Most common complication is acute otitis media and exacerbation of chronic obstructive pulmonary disease.

INVESTIGATIONS

1 .Antigen deduction

2 .RT – PCR

3 .Restriction fragment length polymorphism

4. Compliment fixation

5. Haem agglutination inhibition

6. Enzyme linked immuno assay

TREATMENT:-

Conservative management includes bed rest, hot liquids, anti-pyretics and antihistamines .

Specific management:

1.PLECONARIL

2.INTERFERON-GAMMA

Above these two agents are not used because of their side effects.

3.ZINC : It binds to small crevice on the outer aspect of virus known as binding pockets. This also acts as a binding site of ICAM1. Thus preventing conformational changes in the capsid of virus due to stimulation of ICAM 1 .But it is not used for routine prophylaxis of rhino viral infection.

Introduction of zinc at any point of infection will prevent replication and propagation of infection.

EUROPEAN RESPIRATORY SOCIETY TASK FORCE APPROACH TO PRESCHOOL WHEEZING:-[16]

1. Preschool wheezing is classified in to episodic (viral) induced wheezing or Multitrigger wheezing.
2. The terms used, such as transient, late onset and persistent wheeze should be limited to population – based cohort studies only.
3. In preschool wheezing the term “ASTHMA” should not be used because of lack of evidence of underlying inflammation.

APPROACH TO THE ASSASSMENT OF PRESCHOOL WHEEZING BY EUROPEAN RESEARCH SOCIETY:-

1. In history taking personal history, family history of allergies, pattern and trigger of wheeze and house hold smoking should be assessed.
2. In children requiring long term management allergy testing should be performed.
3. Health care professional should verify when a parent reports with wheezing in their child.

4. Further investigations are needed only in severe, therapy resistant or wheezing associated with clinical features.

PHARMACOLOGICAL THERAPY[17]

For the prevention of symptoms and improvement of long term outcome of preschool wheezing, along with allergen avoidance, parent education, environmental control and pharmacological treatment plays an important role.

ACUTE MANAGEMENT:-[18]

Acute preschool wheezing symptoms are treated with

1. Oxygen
2. Short acting beta-agonists
3. Systemic corticosteroids(prednisolone)

In mild to moderate wheezing due to viral infections oral prednisolone has not been much useful.

The usefulness of ipratropium bromide is minimal. It may have additional effect to short acting beta-agonists, particularly in infants.

PREVENTIVE TREATMENT:-

INHALATION CORTICOSTEROIDS:-[19,20]

In young children with recurrent wheezing, inhalational corticosteroids only have limited long term effectiveness. It has some short term effectiveness but clear disease modifying effect was never seen.

LEUKOTRIENE RECEPTOR ANTAGONIST (MONTELEUKAST):-[21,22,23,24]

It is more useful to prevent virus induced wheezing attacks. Its clinical effect is more likely that of low dose inhalational corticosteroids.

LONG ACTING BETA AGONISTS (LABA):-

Long acting Beta agonists are not recommended in preschool children.

NEBULIZER[25]

A Nebulizer is a device which changes liquid medication into a mist which can be easily inhaled into the respiratory system for the delivery of aerosolized drugs.

AEROSOL DEPOSITION:[26]

The efficacy of an aerosol as a vehicle for delivering drugs in to the lower airways depends mainly on droplet or particle size. Smaller particles have greater chance of peripheral penetration and retention.

The particles with size of more than 10micro meter in diameter are most likely to deposit in the mouth and throat. Particles with size between 5 to 10 micrometers in diameter are deposited in upper airways.

Particles with size less than 5 micrometer in diameter are deposited frequently in the lower airways which are most appropriate for pharmaceutical aerosols.

PARTS OF A NEBULIZER:[27]

1. Compressed air machine.

2. Medication cup for the medication.

3. A thin plastic tube which connects the medication cup to the compressed air machine.

4. A face mask that helps to breath in the mist.

TYPES OF NEBULIZERS:[27]

MECHANICAL NEBULIZER:

1. HOME MADE:-

Mechanical nebulizers are made at home with a help of a sealed bottle with cork using volatile liquid such as alcohol and a ball inflating needle connected to a bicycle pump.

The bottle is closed with a cork and a hole is made in the cork with a drill. A ball inflating needle is inserted in to the cork and connected to a bicycle pump.

With the help of bicycle pump the pressure inside the bottle is increased and the cork is suddenly removed. This rapid change in air pressure will vaporize the liquid in to a mist.

SOFT MIST INHALER:-

It was invented by “Boehringer Ingelheim” medical company in 1997. This inhaler has a spring at the bottom of the liquid container. When the user rotates the bottom of the inhaler to 180^0 the spring in the bottom is activated and releases energy and causes the liquid to spray out of two nozzles leading to soft mist formation.

This device does not use any gas propellant or power source. But the droplet size produced in this technique was 5 to 8 micrometers. This may interfere with the delivery of aerosol in to the lower respiratory system.

HUMAN POWERED NEBULIZER:-

It was invented in “Maquette university” in 2009. It is useful in areas of limited electricity. This technique uses bicycle frame and pedals which are connected to a piston that turns the liquid in to a mist.

ELECTRICAL NEBULIZERS:[28,29]

1. Jet nebulizers.
2. Vibrating mesh nebulizers.
3. Ultrasonic wave Nebulizers.

JET NEBULIZERS:-

These are most commonly used liquid nebulizers. They are also called as “atomizers”.

Jet nebulizers works on the basis of VENTURI PRINCIPLE.

Jet nebulizers use a compressor which makes the liquid medicine in to an aerosol, by driving the compressed air or oxygen to flow at high velocity in to the liquid medicine.

ADVANTAGES:

1. Easy to use.
2. Requires simple tidal breathing.
3. Dose modifications are possible.
4. Dose compounding is also possible.
5. Works at low operational cost.

DISADVANTAGES:-

1. Cost of the air compressor.
2. Need for an external power source.
3. Contamination is possible if not cleaned properly after use.
4. They generate more noise (60 db).
5. Less portable due to heavy weight.

Design modifications in jet nebulizers lead to production two new jet nebulizers,

1. Pari LC plus
2. Dosimetric aeroeclipse.

They act through breath enhanced and act as open vent nebulizers. Now a day's several manufacturers reduced the weight of the jet nebulizers to 635 grams and made it in to a portable device.

VIBRATING MESH NEBULIZERS:-[30]

Ultrasonic vibrating mesh technology (VMT) was invented in 2005.

In this technique a mesh with 1000-7000 holes driven by laser vibrates at the top of reservoir and produces very fine mist of these droplets through the holes.

Available mesh (VMT) nebulizers are:

1. Respironics i- nebulizer
2. Omron micro air
3. Pari eflow
4. Beurer nebulizer IH 50
5. Aerogen Aeroneb

ADVANTAGES:-

1. Shortened treatment time.
2. Does not produce undesired heating.
3. Has not produced much liquid waste at the end of nebulization.
4. Portable, useful during travelling.

DISADVANTAGES:-

1. Battery (powered) operated.
2. Should be cleaned regularly, to prevent blockage.
3. High cost of the instrument.

ULTRASONIC WAVE NEBULIZER:-

It is a new portable nebulizer which was invented in 1964.

In this nebulizer high frequency ultrasonic waves are produced by electronic oscillator that creates mechanical vibration of piezoelectric element.

This vibration converts the liquid in the chamber into a mist. The weight of this machine is only around 170 grams.

ADVANTAGES:-

1. Noise reduction.
2. Portable, compact.
3. Less weight.
4. Do not require saline for aerosol formation.
5. Fast acting.

DISADVANTAGES:-

1. Expensive.
2. Fragile.
3. May cause drug degradation.
4. Do not nebulize suspensions well.

EXAMPLES OF ULTRASONIC NEBULIZERS:-

1. Beurer Nebulizer IH 30.
2. Omron NE- U 17.

PROPER NEBULIZATION TECHNIQUE:-[31]

1. The liquid medication that is used for nebulization should not be out of date.
2. It should be properly stored.

3. The nebulizer machine should be properly working.
4. A minimum of 2 to 3ml of liquid medication is needed to produce required amount of mist.
5. If we use more volume of liquid medication the duration of nebulization time will also be prolonged.
6. The more volume of liquid medication we use initially to nebulizer the more amount of drug will be delivered to the patient.
7. In Jet Nebulizers there will be some residual volume of drug at the end of nebulization.
8. Drug wastage can be minimized by using a volume of at least 4ml of nebulizer solution within 10 minutes time using flow rates of 8 lit/min.
9. The dead volume can be further minimized by tapping the nebulization chamber during nebulization.
10. Before starting Nebulization make the child relaxed as much as possible. And make the child be occupied in some activities like reading or watching something interesting.
11. For young children parents will have to be involved more during nebulization.
12. For older children before giving nebulization they can be told how to hold nebulization chamber during nebulization procedure.

13. A crying child cannot have effective nebulization. So child can be nebulized during sleep with the help of a face mask.
14. Young infants and toddlers can be nebulized with the help of face mask. Older children can be nebulized with the help of mouth piece connected to a nebulizer machine.
15. Older children can be educated to take slow and deep inhalations and occasional short rests with every 30 seconds.
16. A Nose clip can be used to occlude the nose to make sure that the inhalation takes place through the mouth than nose. It can be used in older children not in young infants as it may lead to more agitation in younger children.
17. The duration of nebulization time is between 5 to 15 minutes. It depends on the nebulizer type used, rate, depth of respiration, initial volume of medication used for nebulization and the cooperation of the child.
18. In most cases the majority of drug is delivered during first 5 minutes. By extending beyond 10 minutes little more volume of drug can be delivered to the patient.
19. Sputtering noise of nebulizer bowel signifies that the nebulization procedure is complete and no further mist or medication will be delivered after this time.

MAINTANENCE OF A NEBULIZER:-

CONTROL OF CONTAMINATION:-

- Nebulizers should be rinsed and air dried between each use to prevent clogging of Venturi mask and to avoid contamination with microorganisms.
- Nebulizers should be disinfected by soaking once or twice in a weak with an acetic acid solution for 30 minutes (1 part of distilled vinegar mixed with 3 parts of warm water).
- It can be also disinfected with a quarternary ammonium compound for about 10 minutes. Finally nebulizers should be rinsed with tap water.
- Compressor filter and nebulizer should be replaced every 6 months.

CONTROL OF ALLERGENS:-

The allergens such as cat, dog, mouse and cockroaches can contaminate the reservoir of nebulizers.

Proper storage and cleaning of nebulizer will prevent it from contaminating with allergens.

DETERIORATION OF FUNCTION:-

With repeated use of nebulizers, its performance deteriorates with time. Proper usage and maintenance of nebulizers will slow down the deterioration time.

The replacement time for each nebulizer depends on the manufacturer's recommendation but it should not exceed 6 months.

DRUGS THAT CAN BE DELIVERED THROUGH NEBULIZATION.

1. Salbutamol
2. Corticosteroids,
3. Ipratropium,
4. Adrenaline,
5. Hypertonic saline
6. Normal saline

Can be delivered through nebulizers. Drugs are available as respules or vials. When vials are used drugs should be diluted with saline and not with plain water.

POTENTIAL HAZARDS OF NEBULIZATION:-

Salbutamol Nebulization without oxygen in a sick child with wheeze can cause preferential bronchodilatation resulting in ventilation perfusion mismatch and leads to deterioration in clinical condition of the child. Hence nebulization should always have to be given with oxygen in a sick child.

An alternative to using Jet nebulizer is connecting nebulization chamber to oxygen humidifier and using oxygen driven nebulization. Oxygen delivered at rates of 8-10 liters / minute break the drug solution into mist and results in effective nebulization.

VARIOUS SCORING SYSTEMS USED FOR THE ASSESSMENT OF RESPIRATORY DISTRESS:

1. Wang's scoring system
2. Respiratory distress assessment instrument
3. Asthma clinical severity scoring

PARAMETERS USED IN WANG"S SCORING SYSTEM

1. Respiratory rate
2. Oxygen saturation
3. Capillary refill time

4. Chest retractions

5. Air entry

6. Level of consciousness

PARAMETERS USED IN RESPIRATORY DISTRESS ASSESSMENT INSTRUMENT

1. Wheezing(inspiratory,expiratory)
2. Location
3. Retractions(supra clavicular, infra clavicular,sub costal)

4 .Respiratory rate

PARAMETERS USED IN ASTHMA CLINICAL SEVERITY SCORE

1. Respiratory rate

   A.2 to 3 years

   B.4 to 6 years

2. Oxygen saturation in room air
3. Auscultation
4. Retractions
5. Dyspnea.

WANG"S SCORING SYSTEM

Respiratory Rate	0 – NORMAL	1 – MILD	2 – MODERATE	3 - SEVERE
	< 40	40-50	50-60	>60
Color O2 Saturation on room air Cap Refill	Normal >97% <2 sec	Normal 94-96% on Room air < 2 sec	Normal 90-93% < 2 sec Normal color on 02 ≤ 1 lpm	Dusky, Mottled < 90% => 3 sec Normal color on 02 > 1 lpm
Retractions / WOB	None	Sub costal retractions	Inter costal and Sub costal retractions when Quiet	Supra clavicular Sternal retractions Paradoxical Respiration
Air Entry Wheezing	Breath Sounds Clear / Good	Good Entry End Expiratory Wheeze +/- Rales	Fair Air Entry Inspiratory and Expiratory Wheeze +/- Rales	Poor / Grunting Inspiratory and Expiratory Wheeze +/- Rales
LOC	Normal /Alert	Mild Irritability	Restless when Disturbed-Agitated	Lethargic Hard to Arouse

RESPIRATORY DISTRESS ASSESSMENT INSTRUMENT

Respiratory Distress Assessment Instrument					
Wheezing	**0**	**1**	**2**	**3**	**4**
Expiration	None	End	1/2	3/4	All
Inspiration	None	Part	All		
Location	None	Segmental <2 of 4 lung fields	Diffuse > 3 of 4 lung fields		
Retractions					
Supra Clavicular	None	Mild	Moderate	Marked	
Inter costal	None	Mild	Moderate	Marked	
Sub costal	None	Mild	Moderate	Marked	
Respiratory Rate					

ASTHMA CLINICAL SEVERITY SCORE

Respiratory Rate	1 Point	2 Point	3 Point
2-3 Years	< 34	35-39	> 40
4-6 Years	< 30	31-35	> 36
Oxygen Saturation in room air	> 95	90-95	< 90
Auscultation	Normal or End Expiratory wheezing	Expiratory wheezing	Inspiratory & Expiratory wheezing / decreased breath sounds or both
Retractions	None / Intercostal retractions	Inter costal & Sub sternal retractions	Inter costal / Sub costal & Supraclavicular retractions
Dyspnea	Speaks in sentences	Speaks in short sentences	Speaks in single words / Grunts
CS Score	5-7 (Mild)	8-11 (Moderate)	12-15 (Severe)

REVIEW OF LITERATURE

Dorit ater et al, conducted a study on hypertonic saline with albuterol in preschool children with acute wheezing episodes. It was a prospective randomized double blind study. In this study children aged between 1 to 6 years attending emergency department are evaluated for the efficacy of 5% hypertonic saline with albuterol was compared with 0.9 % normal saline with 0.5ml albuterol. The sample size was 41. These children after randomization given 1 dose of albuterol inhalation. Then they are given 4ml of 5% hypertonic saline with 0.5ml of albuterol or 4ml of 0.9% normal saline with 0.5 ml of albuterol 2 doses with 20 minutes interval four times a day.

In this study the primary outcome measured was length of hospital stay. The secondary outcome measured was clinical severity score and admission rate. In 5% hypertonic saline group 16 children were involved and in 0.9% normal saline group 25 children were involved. In this study length of stay was significantly lower in hypertonic saline group than normal saline group. Median 2 days (range 0 to 6) against 3 days (range 0 to 5) days. P value was 0.027.

Admission rate was significantly lower in hypertonic saline group in comparison with normal saline group. The admission rate was 62.2% in hypertonic saline group, against 92% in normal saline group. The

clinical severity score significantly improved in both groups. But there is no significant correlation between them.[3]

Mark R Elkins et al conducted a study of mechanism of action of hypertonic saline in cystic fibrosis patients. They found out that inhalation of various concentration of hypertonic saline increased the ability of the patients to expectorate the mucous from the respiratory tract.[4]

Reider and Colleagues conducted a cross sectional study in persons with cystic fibrosis disease exacerbation. In this study persons are divided in to two groups: normal saline group and hypertonic saline (6%) group. Prior to the physiotherapy they were given nebulization with 0.9% and 6% hypertonic saline and 1 hour after sputum was collected from these patients after physiotherapy. Sputum expectoration was more in hypertonic saline group than in normal saline group.[32]

E. Michael sarrel and Colleagues conducted a study in ambulatory children with viral bronchiolitis with 3% hypertonic saline nebulization. They had found out that 3% hypertonic saline along with terbutaline has effectively decreased the symptoms of bronchiolitis in these children.[33]

Avigdor Mandelberg and Colleagues conducted a study in infants with viral bronchiolitis with Epinephrine 1.5mg and 4ml of 0.9 % saline or 3%

hypertonic saline. They found out that 3% hypertonic saline along with 1.5mg of epinephrine inhalation had decreased the signs and symptoms in comparison with 0.9% saline along with 1.5mg of epinephrine.[34]

Suri et al conducted a study on the effect of hypertonic saline and durnase – alpha on the inflammatory mediators in cystic fibrosis. They have found out that after 3% hypertonic saline inhalation, the Interleukin levels are significantly reduced[35].

E.Daviskas et al, conducted a study on the effect hypertonic saline inhalation in mucociliary clearance of both normal and asthmatic people. In this study 10 healthy individuals and 12 asthmatic subjects were involved. To these subjects ultrasonically nebulized 0.9% saline, ultrasonically nebulized 14.4% saline and a control to which no aerosol is added, given at three separate days. $^{99m}_{TC}$ _ sulphur colloid, computer analysis and Gamma camera were used for measuring mucociliary clearance.

The asthmatic persons were given 2.2 ± 1.2ml mean ± SD volume of 14.4% saline. And the healthy subjects received 3.2 ± 0.7ml of 14.4% saline. The time taken for the delivery of this volume of saline was 5.4 ± 1.3 min and 6.4 ± 0.7 min for asthmatic subjects and healthy subjects.

The effect of 14.4% saline on the airway was measured with the help of fall in forced expiratory volume in one second which was measured separately on the next visit. The FEV_1 for asthmatic subjects was 22 ± 4% and 3 ± 2.1% for healthy subjects.

While comparing the mucociliary clearance of control and 0.9% saline, the hypertonic saline group has increased mucociliary clearance. With this results they concluded that inhalation of hypertonic saline increases mucociliary clearances in both asthmatic and normal subjects.

PG.Middleton et al, studied the effect of hypertonic saline on the transport of ions across the airway epithelium. In this study 7 nonsmoking subjects were chosen for the study. It was ensured that they had not under gone any surgery within 4 weeks or had any respiratory tract infection. They are given hypertonic saline nebulization and mannitol nebulization. Then the nasal potential difference measured by passage of small exploring electrode through the floor of the nose.

The value of 1m mannitol is some like that of 500mm of sodium chloride. By this study they concluded that the human respiratory epithelium responds independently to the altered osmolarity[5].

Jasmijn teunissen et al, studied the effect of 3% and 6% hypertonic saline in viral bronchiolitis.

The primary aim of their study was length of stay and the secondary outcome were need for supplemental oxygen and tube feeding.

The sample size was 292 but only 247 were completed the study. They were given 3%, 6% and 0.9% normal saline during hospital stay. They also added salbutamol for possible bronchoconstriction. The mean time for hospital stay was not altered in these three groups. AT the end of their study they have concluded that the hypertonic saline nebulization did not reduced the length of stay in the hospital[37].

Zhang l, Mendoza et al, conducted 11 randomized control trails including 1090 infants. They conducted 500 in patient's trials,1 trail in 65 out patients, 4 trails on 525 patients in emergency room. Totally 560 patients received hypertonic saline. In these 560 patients, 503 patients received 3% hypertonic saline and 57 patients received 5% saline.

AT the end of the study they came to a conclusion that 3%hypertonic saline significantly reduced the length of stay in infants admitted for bronchiolitis[2].

Shawn Ralston et al, conducted a retrospective cohort study in which 444 doses of 3% hypertonic saline were administered to children less than 1 years of age. In these total doses 377 were given without bronchodilators. In the entire study only 4 adverse effects has occurred with 1%. By the end of the study they came to a conclusion that 3% hypertonic saline solution without adding bronchodilators had low adverse effect[38].

STUDY JUSTIFICATION

Most of acute wheezing episodes requiring hospitalization are caused by viruses.

A therapy which maintains Airway hydration, promoting mucous clearance and reducing sub mucosal edema are required for reducing, admission rate, morbidity and length of stay. The studies which were done previously included children with bronchiolitis. There are no studies on Indian context, since seasonal variation is different from country to country. This study will be done in children between 2 to 6 years by excluding bronchiolitis. In a country like India this therapy if proven will be cost effective and feasible.

OBJECTIVE OF THE STUDY

To compare the efficacy of hypertonic saline versus normal saline as a vehicle for salbutamol Nebulization in acute wheezing attacks in children aged 2 to 6 years attending a tertiary care hospital.

METHODOLOGY

1. STUDY DESIGN:-

Clinical trial (Quasi experimental design).

2. STUDY SETTING:-

CASUALTY OF "INSTITUTE OF CHILD HEALTH", EGMORE, CHENNAI.

3. STUDY PERIOD:-

March 2014 to September 2014.

4. TIMELINE:-

DATA COLLECTION:- March 2014 to July 2014.

DATA ANALYSIS AND

MANUSCRIPT PREPARATION:-} AUGUST 2014.

SUBMISSION OF REPORT:- September 2014.

5. STUDY POPULATION

6. INCLUSION CRITERRIA:-

All children aged 2-6 years with acute wheezing attacks with clinical severity score of > 8.

EXCLUSION CRITERIA:-

1. Children with cardiac disease.
2. Children with chronic renal disease.
3. Children requiring ICU admission.

SAMPLE SIZE:-

100.

SAMPLE SIZE CALCULATION:-

Assuming an effect size of 0.25(from previous studies) with α error of 5% and power of 80% sample size of 50 in each group was arrived.

DEFINITIONS USED:-

CASES:-

Children who received 3% hypertonic saline Nebulization along with salbutamol were called cases or treatment group.

CONTROLS:-

Children who received 0.9% normal Saline Nebulization along with salbutamol.

ADMISSION CRITERIA:-

Asthma clinical severity score of >6.

PARAMETERS USED:-

1. Respiratory rate.
2. Auscultation.
3. SPO2.
4. Speech.
5. Subcostal retractions.

Each parameter scored as 1, 2, and 3.

Total score categorized as

1. Mild (5 to 7),

2. Moderate (8 to 11),

3. Severe (12 to 15).

OUTCOME MEASURED:-

1. Admission rate

2. Clinical severity score <6 after 3 doses of nebulization.

STUDY MANOUVERE

The children were enrolled on the basis of inclusion criteria after obtaining written informed consent from either of parent. Base line demographic data and clinical history were noted in standard format. A baseline clinical severity score was obtained based on clinical examination at the start of the study.

THE PROFORMA HAD THE FOLLOWING DATA:-

1. Patient Name
2. Age
3. Sex
4. OP Number
5. Address
6. History of Breathlessness
7. History of chest retractions
8. History of cyanosis
9. History of noisy breathing
10. History of refusal of feeds
11. History of vomiting
12. History of Immunization
13. Socio economic status
14. Past history of asthma

15.History of previous nebulization

EXAMINATION

1. Height

2. Weight

3. Sensorium

4. Nutritional status

5. Vitals

6. Respiratory rate

7. Work of breathing

8. Tracheal position

9. Breath sounds

10. Oxygen saturation

11. Speech

12. Examination of cardiovascular, abdomen and central nervous systems.

Before starting of the study the children were examined by undressing of upper part of the body. The child's attention was diverted so that clinical examinations can be done correctly.

Every alternate child was treated as control and cases. Each control was given 0.5 ml of salbutamol and 3.5 ml of normal saline nebulization with oxygen 3 times at 20 minutes intervals. Total volume of 4ml of liquid was used for nebulization.

Each case was given 0.5ml of salbutamol and 3.5ml of hypertonic saline nebulization with oxygen three times at 20 minutes interval.

At the end of nebulization children in both groups were assessed on the basis of clinical severity score. Children with clinical severity score of more than 6 were admitted and with less than 6 were not admitted and treated as out patients.

During the study 14 children were eliminated according to exclusion criteria. Out of 14 children 8 children had cardiac problems, 3 had renal problems and 3 children needed intensive care treatment.

The results were enrolled in excel sheet and data was made for statistical analysis. Using SPSS software statistical data obtained.

DESCRIPTION OF VARIABLES:-

1. **Respiratory rate:-**

Respiratory rate was counted for a full one minute. Before counting respiratory rate child was kept in mothers lap in upright position to decrease anxiety. The clothes of upper part of the body were removed before counting respiratory rate. Using a watch with seconds hand respiratory rate was counted by inspection for a full 60 seconds. One chest rise and fall were counted as one breath.

While counting respiratory rate attention of the child was diverted to prevent anxiety.

2. **Oxygen saturation:-**

Oxygen saturation was measured with a help of Nelcor pulse oximeter. Probe of the pulse oximeter was put over the child's finger or toes which are not nail polished.

3. **Auscultation:-**

Before auscultation child's clothes on the upper part of the body was removed and child was kept on mothers lap. Child's attention was diverted and auscultated with the diaphragm of the stethoscope in all auscultatory areas (supraclavicular, infra clavicular, axillary, infra axillary, supra scapular, infra scapular, inter scapular areas) for adventitious sounds.

4. **Speech:-**

Child was asked some questions and its speech pattern was noted. Whether child was able to speak in full sentence or in short sentence or in single words was noted.

5. **Work of breathing:-**

Work of breathing was noted by undressing the child's upper part of the body and looking for intercostal, subcostal and supraclavicular retractions.

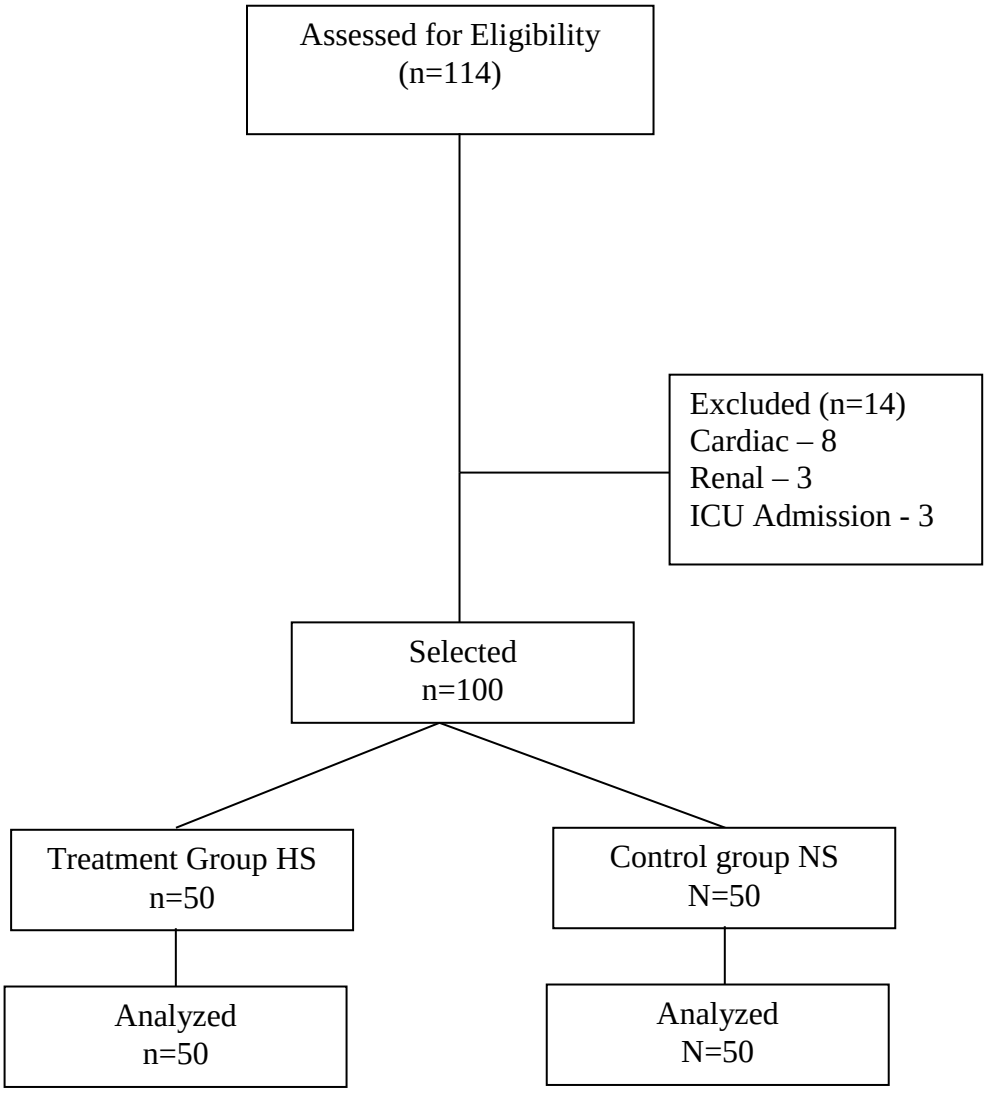
STATISTICAL ANALYSIS

Data was entered in excel sheet. Statistical analysis was done using statistical software SPSS. Qualitative variables were expressed as proportion and quantitative variables as mean and standard deviation. Outcome variable was described as risk difference with 95% confidence interval.

ETHICAL CONSIDERATIONS

- Ethical clearance from institutional review board was obtained.
- Written informed consent was obtained from parent of each patient.
- Strict confidentiality of data was maintained.

FLOW CHART



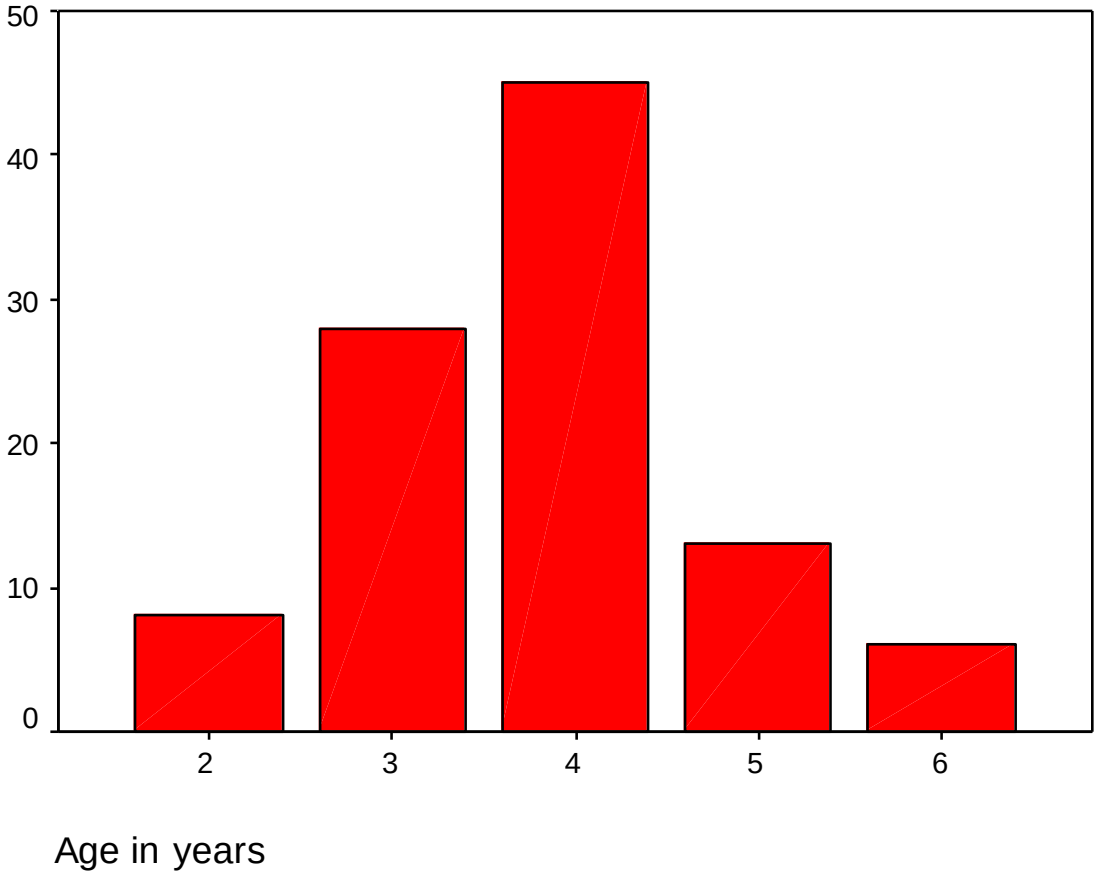
Out of 114 children assessed 14 were eliminated (8 cardiac cases, 3 renal and 3 ICU admissions) and 100 cases were analyzed.

TABLE SHOWING FREQUENCY OF AGE IN STUDY POPULATION

Age in years	Frequency	Percent
2	**8**	**8.00**
3	**28**	**28.0**
4	**45**	**45.0**
5	**13**	**13.0**
6	**6**	**6.0**
Total	**100**	**100.0**

In this frequency table majority of the children were (45) in 4 years of age.

This bar diagram showing age frequency in study population



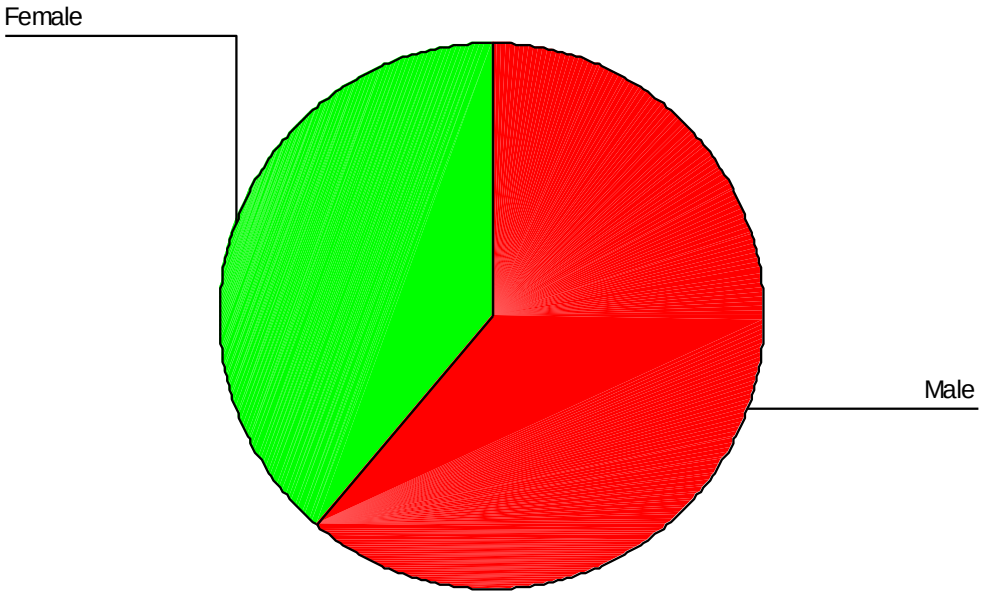
Majority of the children were in 4 years of age group.

TABLE SHOWING FREQUENCY OF SEX DISTRIBUTION

Sex	Frequency	Percent
Male	61	61.0
Female	39	39.0
Total	100	100.0

In this study 61% were males and 39% were females.

Pie chart showing frequency of sex distribution.



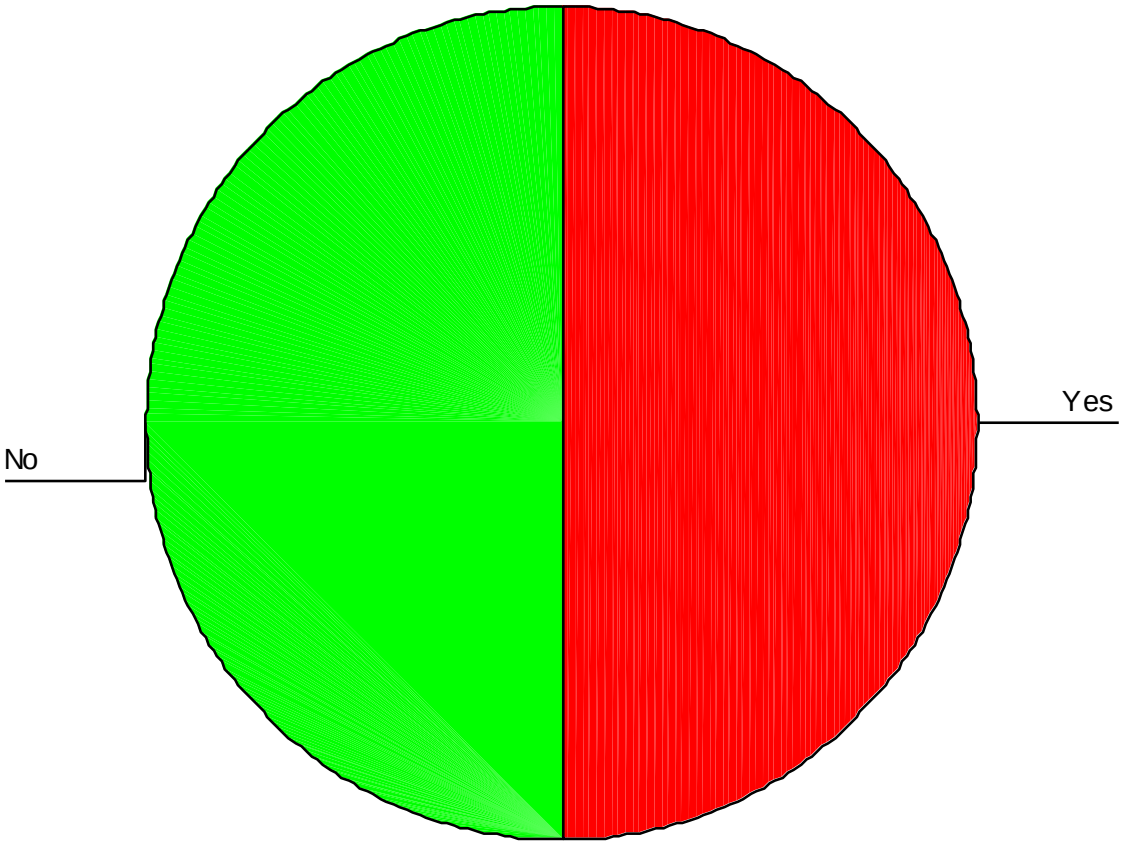
Majority of population were (61%) males.

TABLE SHOWING H/O ASTHMA IN FAMILY

Family History of Asthma	Frequency	Percent
Present	50	50.0
Absent	50	50.0
Total	100	100.0

50% had family history of Asthma and 50% had none.

Pie chart showing frequency of family history of Asthma in study population.



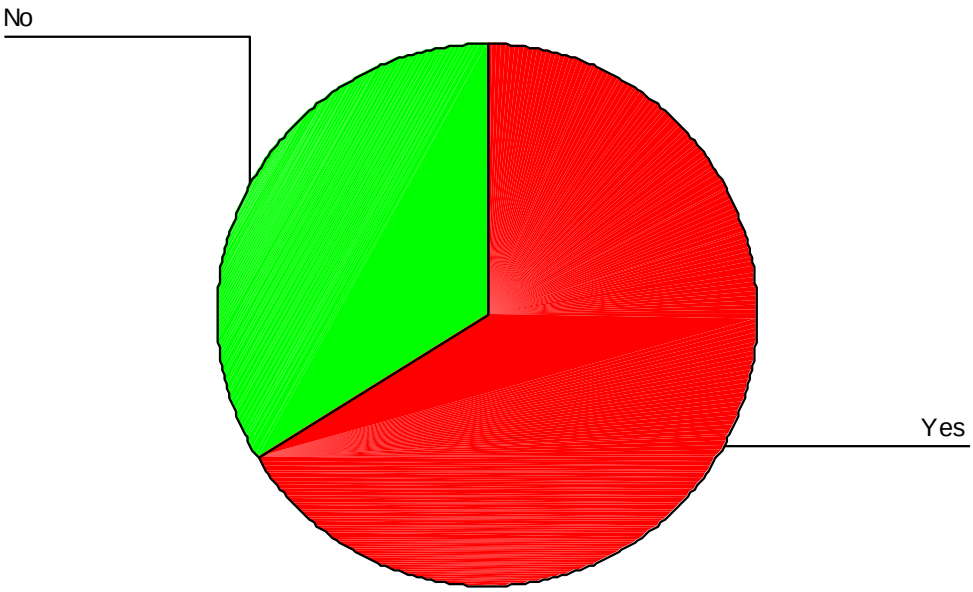
50% had family history of Asthma

FREQUENCY TABLE SHOWING HISTORY OF PREVIOUS NEBULIZATION IN STUDY GROUP

H/O Previous Nebulization	Frequency	Percent
Yes	66	66.0
No	34	34.0
Total	100	100.0

66% had previous Nebulization and 34% had no history of previous Nebulization.

Pie chart showing frequency of previous nebulization in study population



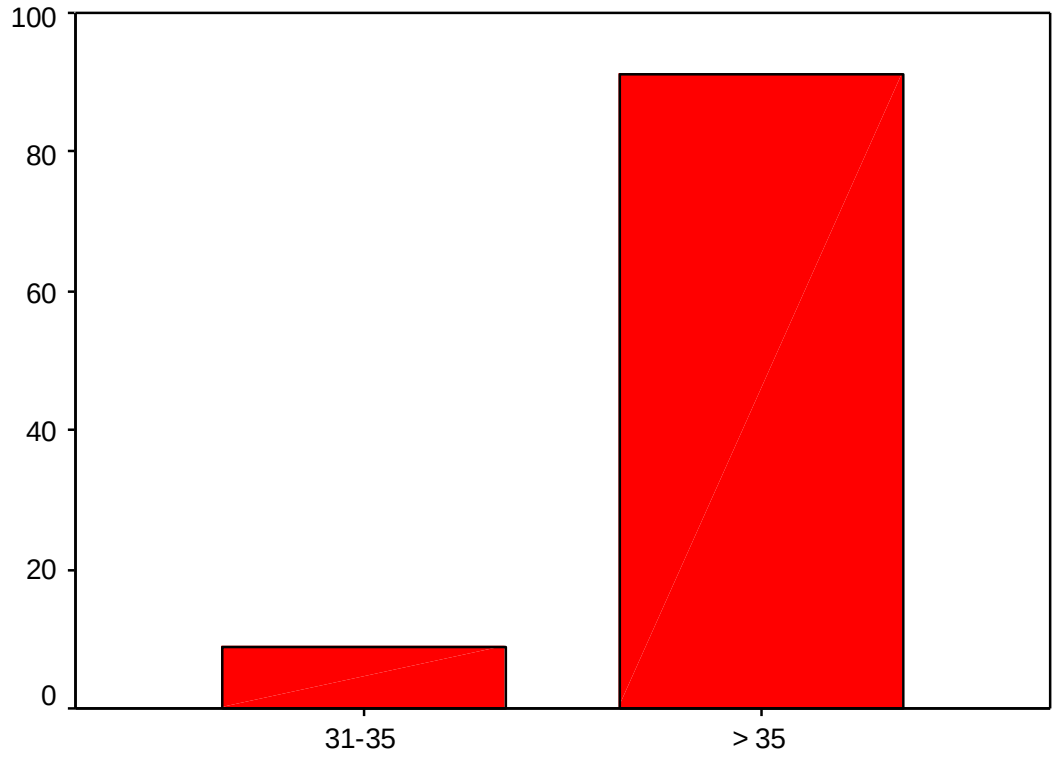
66% of children had previous history of nebulization

Frequency table showing respiratory rate in study population

Respiratory Rate/ min	Frequency	Percent
31-35	9	9.0
> 35	91	91.0
Total	100	100.0

In this study majority (91%) of children had respiratory rate of > 35

Bar diagram showing frequency of respiratory rate in study population



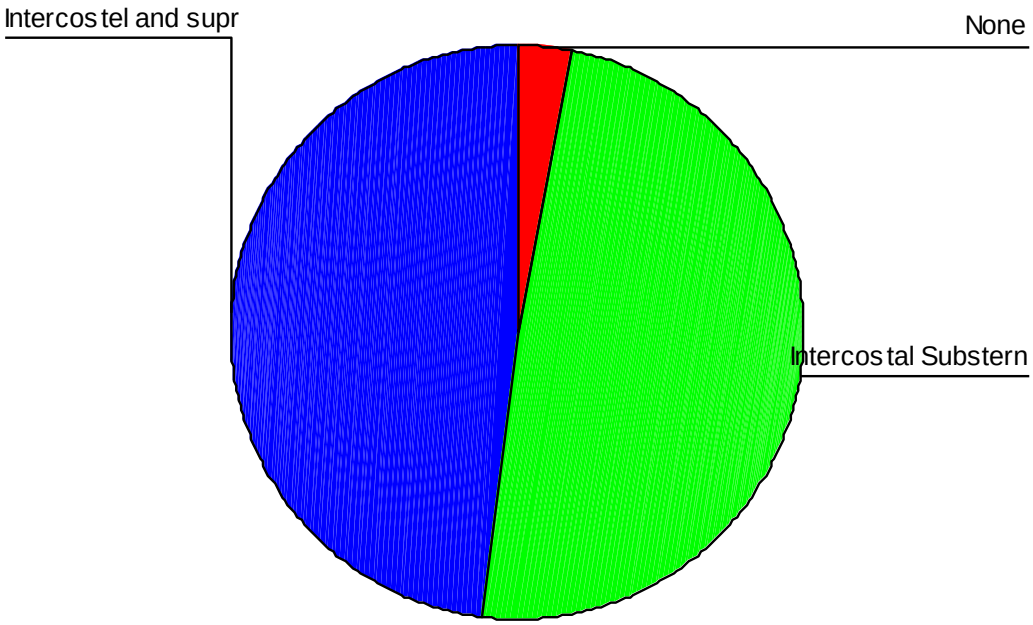
9% children had respiratory rate of between 31-35 and 91% had more than 35.

Frequency table showing work of breathing in study population

Work of Breathing	Frequency	Percent
None	3	3.0
Intercostal / Sub sternal	49	49.0
Intercostal and supraclavicular	48	48.0
Total	100	100.0

Out of 100 children 49 had inter costal or sub sternal retractions, 48 had intercostal and supraclavicular retractions, 3 had none.

PIE CHART SHOWING FREQUENCY OF WORK OF BREATHING IN STUDY POPULATION



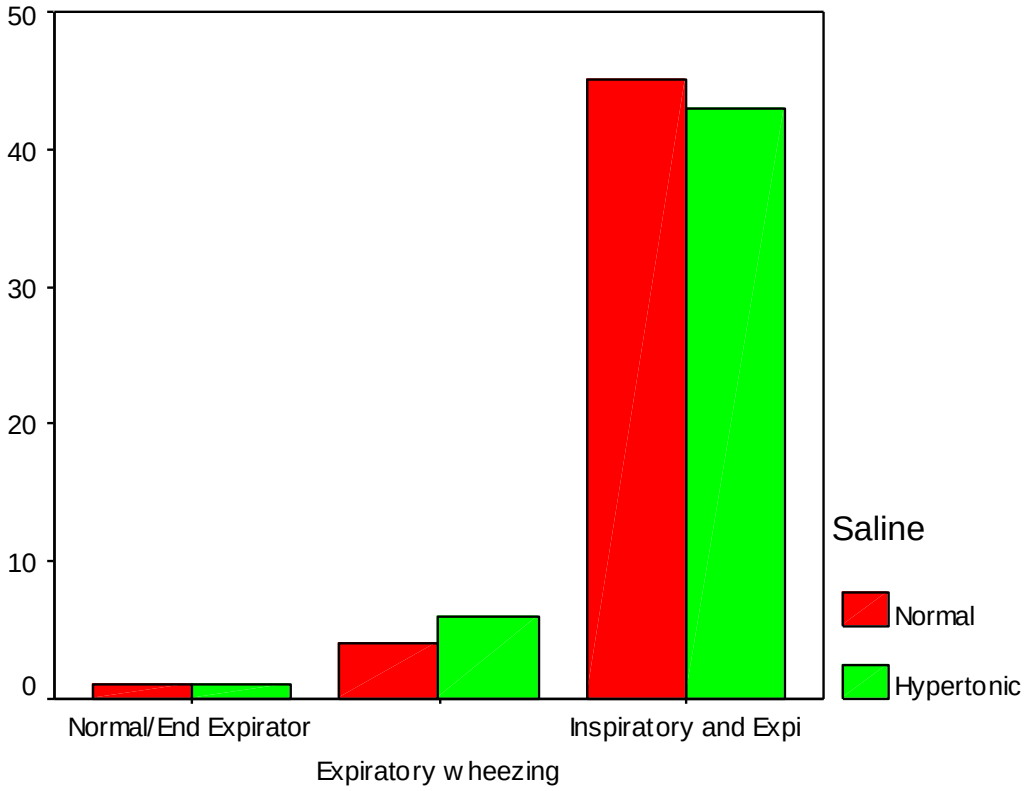
Majority(49) of children had intercostal or sub sternal retractions.

Frequency of breath Sounds in study population

Breath Sounds	Frequency	Percent
Normal/End Expiratory wheezing	2	2.0
Expiratory wheezing	10	10.0
Inspiratory and Expiratory	88	88.0
Total	100	100.0

88% of children had inspiratory & expiratory wheezing, 10% had expiratory wheezing and 2% had normal or end expiratory wheezing.

Bar diagram showing Breath Sounds in study population



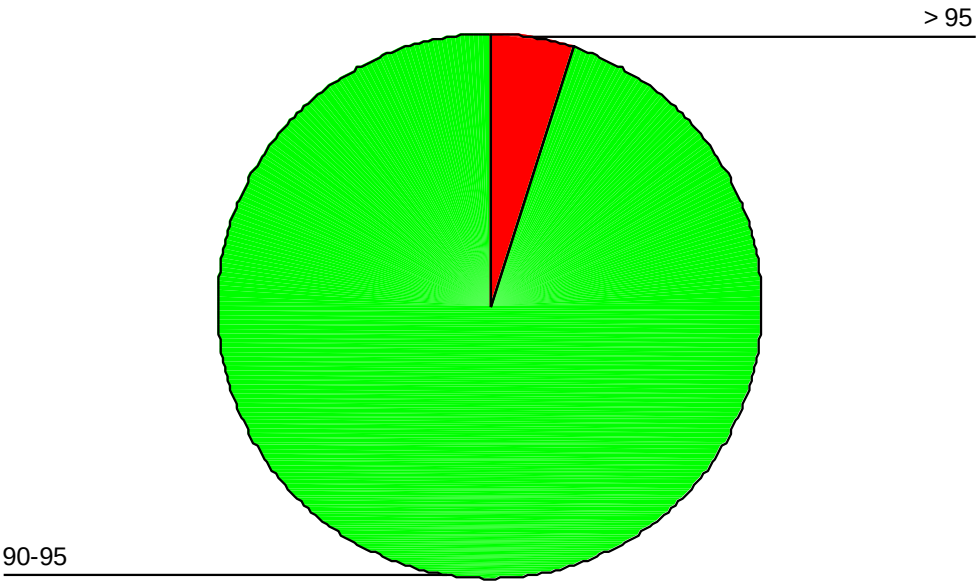
Majority of children (88%) had inspiratory and expiratory wheezing.

Frequency table showing oxygen saturation in study population

SPO2 in %	Frequency	Percent
>**95**	5	5.0
90-95	95	95.0
Total	100	100.0

Out of 100 children 95% had oxygen saturation of 90 to 95% and 5% had oxygen saturation of> 5%.

Pie chart showing frequency of oxygen saturation in study population



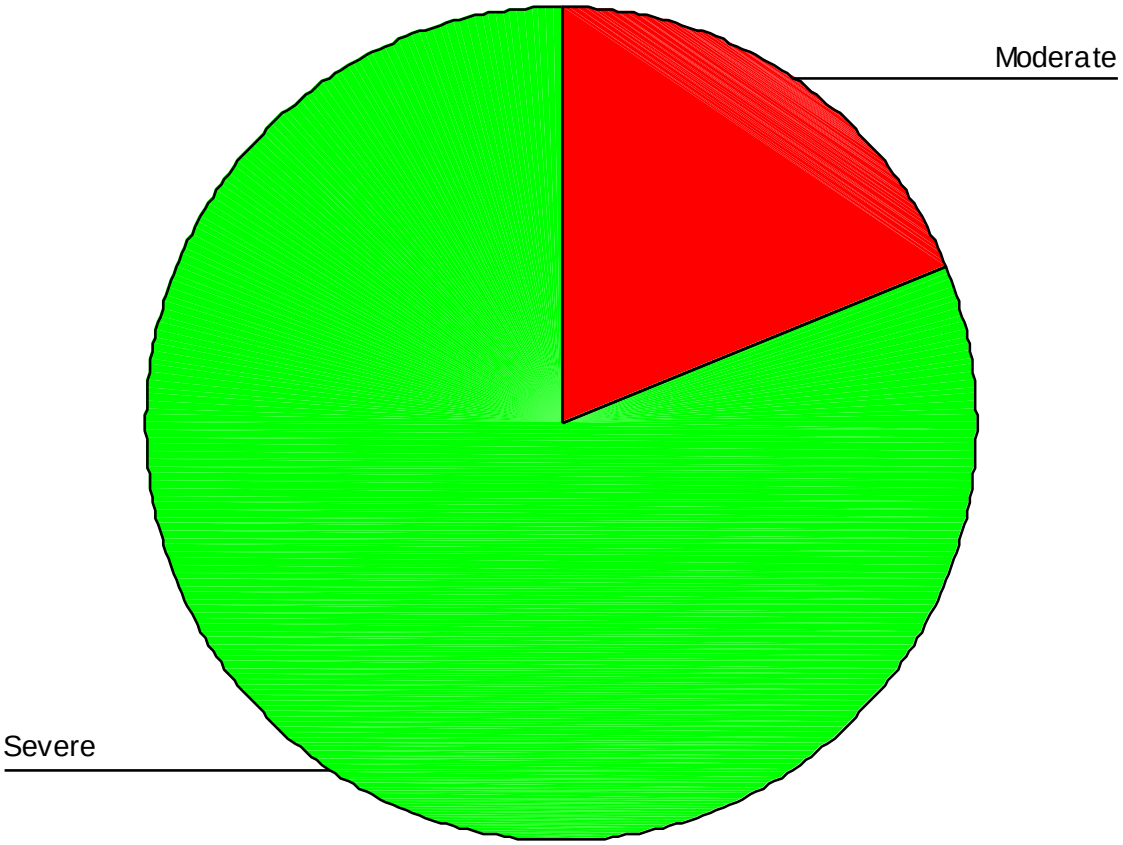
Majority of children (95%) had oxygen saturation of 90 to95 % and 5% had more than 95%.

Frequency table showing base line Score in study population

Base line Score	Frequency	Percent
Moderate	19	19.0
Severe	81	81.0
Total	100	100.0

81 % of children had severe base line score and 19 % had moderate base line score.

Pie chart showing distribution of base line score in study population



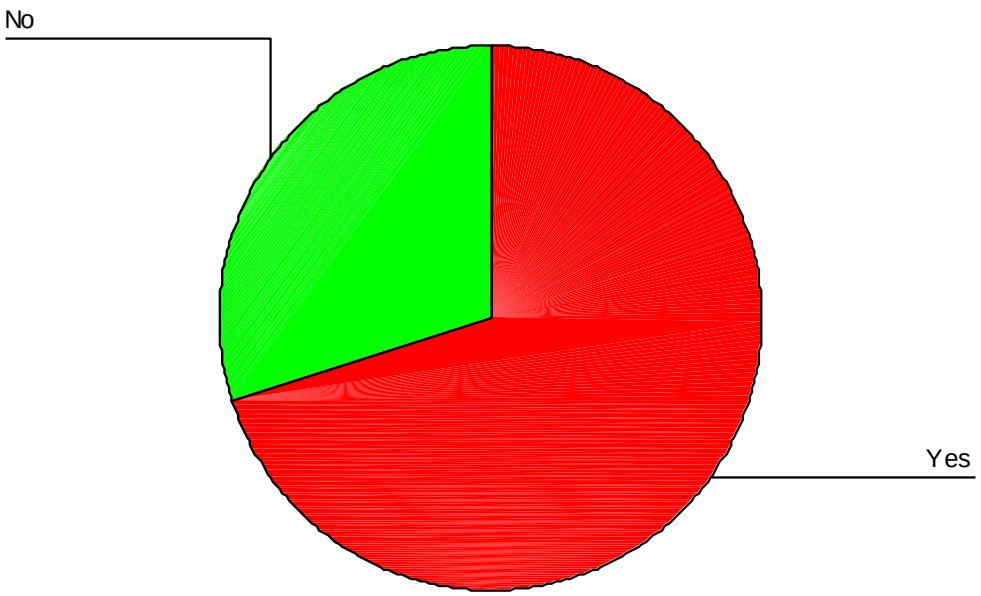
Majority of children had severe base line score of 81%.

Frequency showing Admission Rate in study population

Admission Rate	Frequency	Percent
Admitted	70	70.0
Not Admitted	30	30.0
Total	100	100.0

Out of 100 children 70% were admitted and 30% were not admitted.

Pie chart showing frequency of admission rate in study population



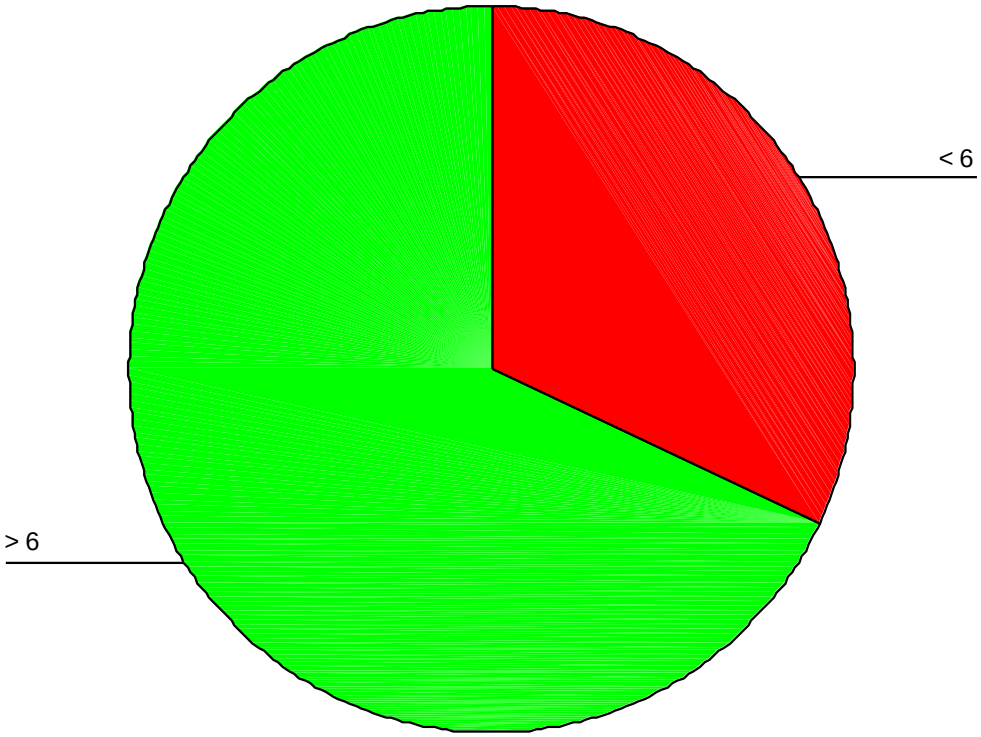
Majority of children (70%) were admitted in this study

Frequency table showing Clinical Severity Score in study population

Clinical Severity Score	Frequency	Percent
< 6	32	32.0
> 6	68	68.0
Total	100	100.0

Majority (68%) of children had clinical severity score of >6.

Pie chart showing clinical severity score in study population



Out of 100 children 68% had clinical severity score of > 6 and 32% had <6.

Adverse effects

Out of 100 children none of them had developed any adverse effects during the study.

Speech

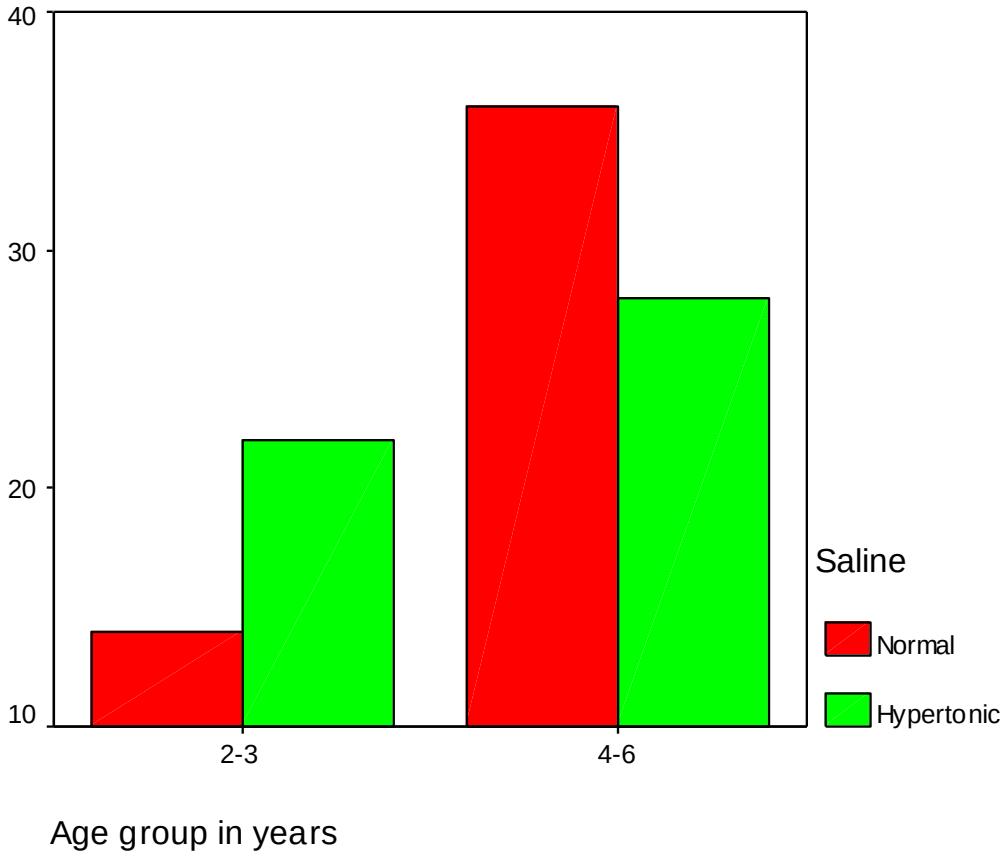
All the children were able to speak in short sentences.

Cross table showing Age group in years

Age group in years	Saline				Total	P value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
2-3	14	28%	22	44%	36	0.096
4-6	36	72%	28	56%	64	
Total	50		50		100	

P value is 0.096 and it is not significant, meaning that both groups are comparable in terms of age.

Bar diagram showing age group of children in this study.



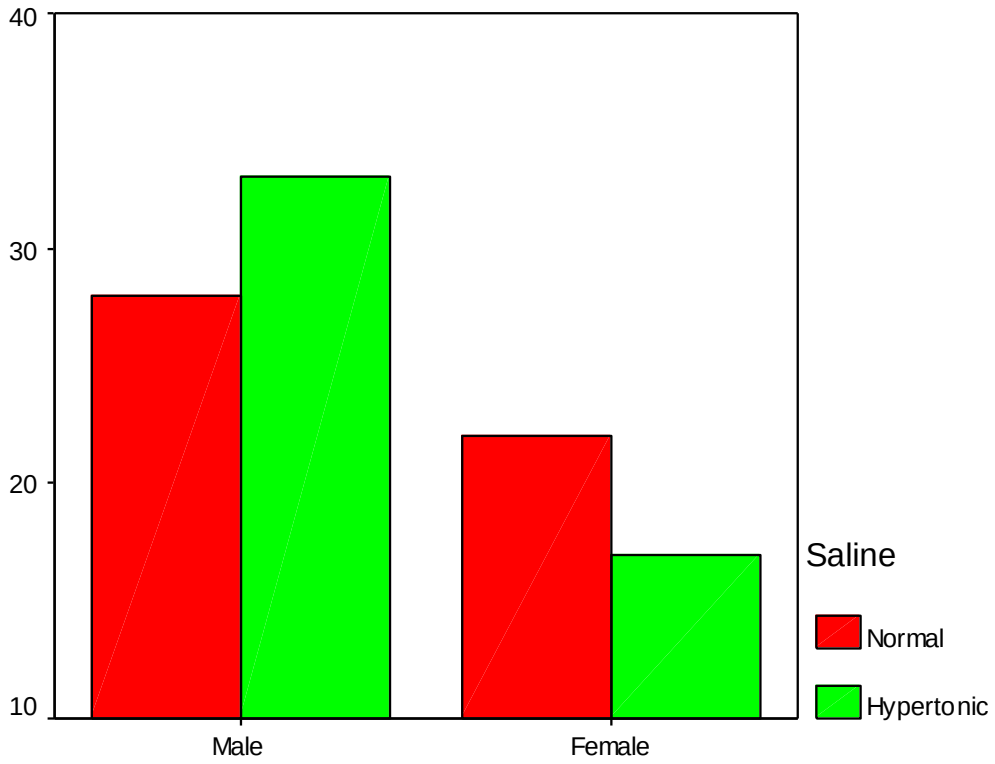
P value is 0.096 and it is not significant.

Cross table showing Sex ratio of children in this study

Sex	Saline				Total	P Value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
Male	28	56	33	66	61	0.305
Female	22	44	17	34	39	
Total	50		50		100	

The P value is 0.305 and it is not significant, meaning that sex ratio was comparable in both groups.

Bar diagram showing sex ratio in study population



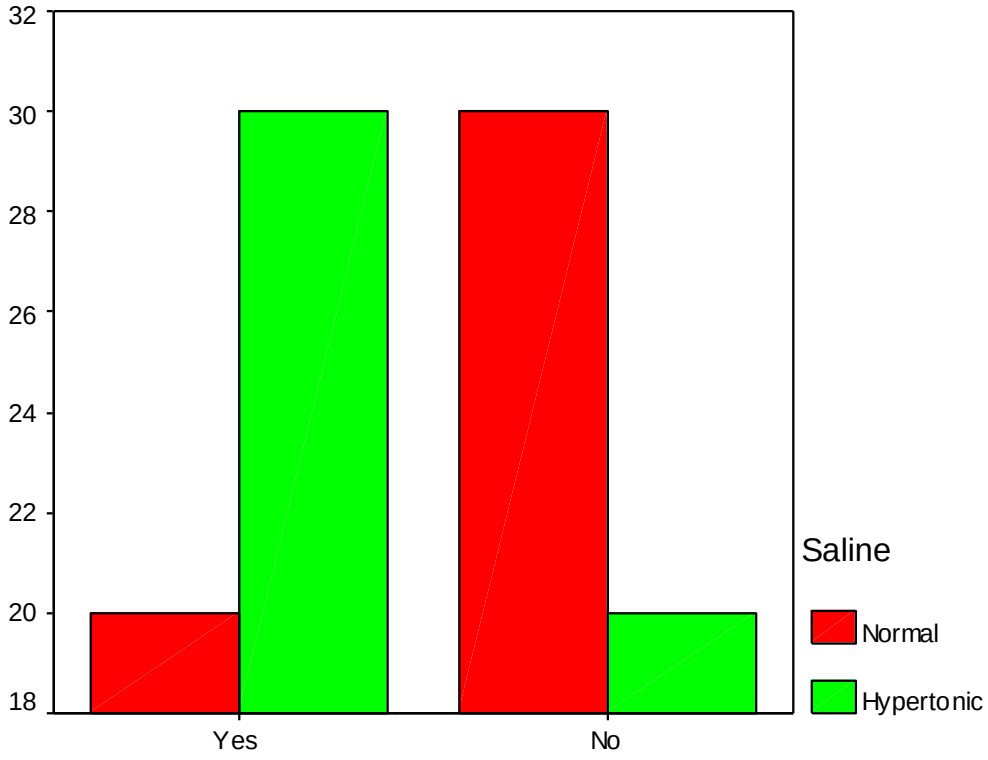
P value is 0.305. It is not significant. So both groups were comparable in terms of sex ratio.

Cross table showing H/O Asthma in Family in the study population

H/O Asthma In Family	Saline				Total	P Value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
Yes	20	40	30	60	50	0.046
No	30	60	20	40	50	
Total	50		50		100	

The P value is 0.046 and it is significant.

Bar diagram showing family history of asthma in the study population



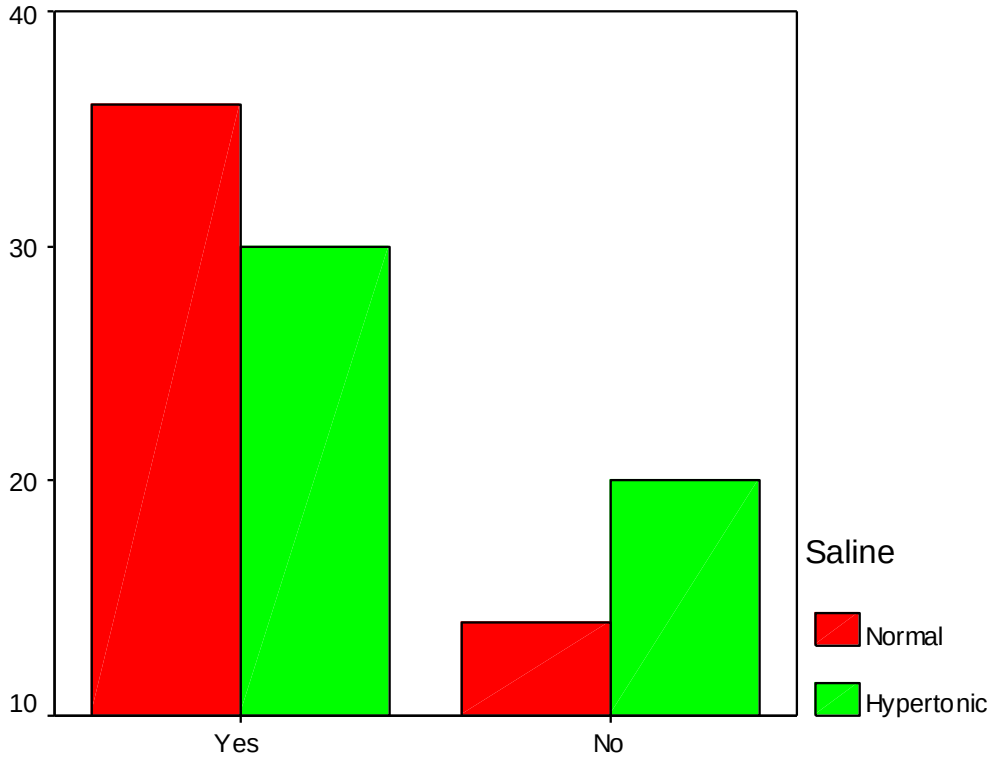
P value is 0.046 and it is significant.

Cross table showing percentage of children with History of Previous Nebulization

H/O Previous Nebulization	Saline				Total	P Value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
Yes	36	72	30	60	66	0.205
No	14	28	20	40	34	
Total	50		50		100	

P value is 0.205 and it is not significant, meaning that both groups were comparable in terms of History of Previous Nebulization.

Bar diagram showing History of Previous Nebulization in both groups



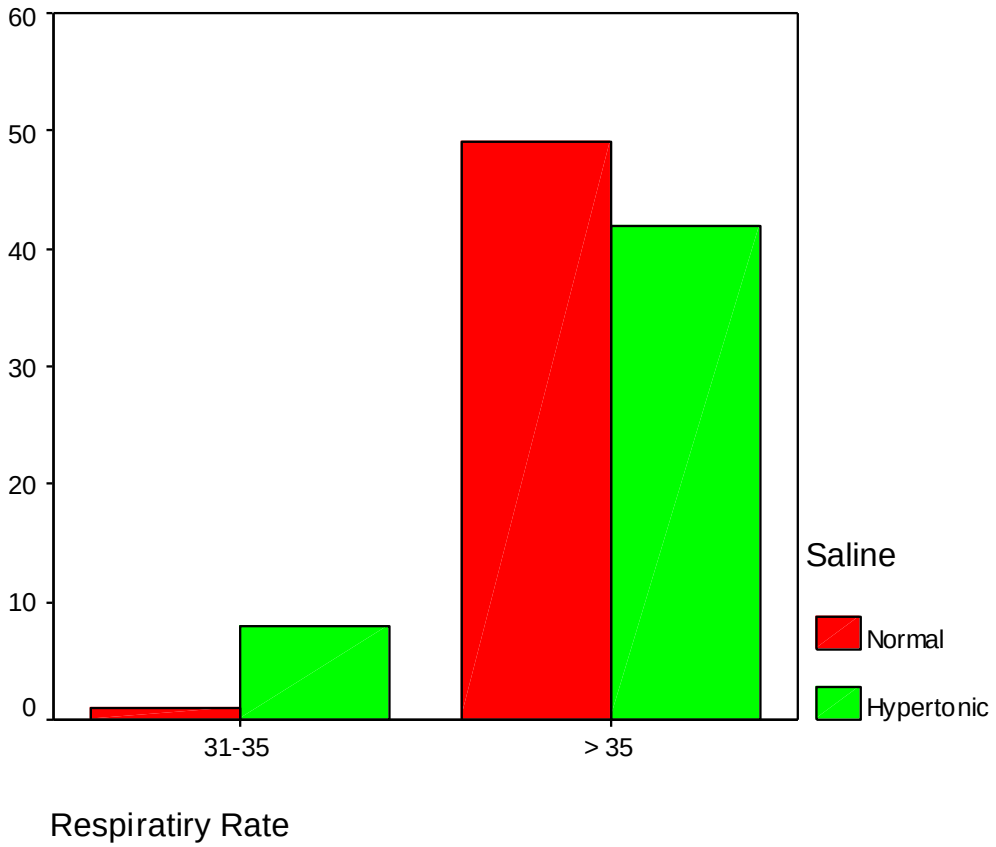
P value is 0.205 and it is not significant. So both groups were comparable.

Cross table showing Respiratory Rate in study population

Respiratory Rate	Saline				Total	P Value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
31-35	1	2	8	16	9	0.014
> 35	49	98	42	84	91	
Total	50		50		100	

P value is 0.014 and it is significant.

Bar diagram showing respiratory rate in this study population



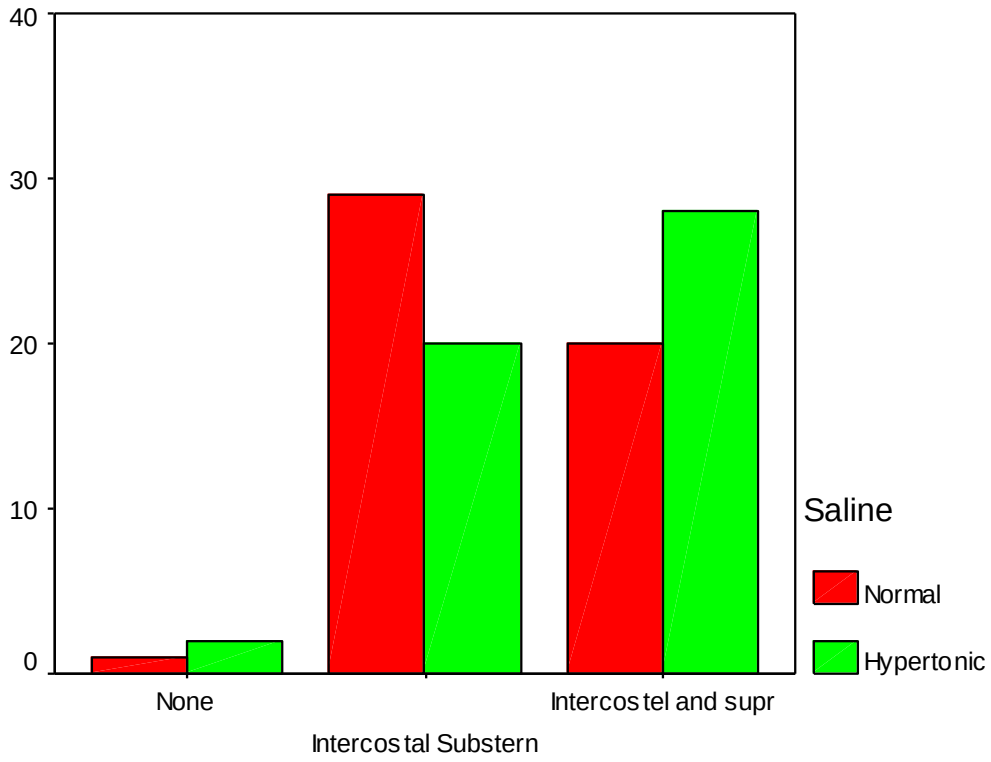
P value is 0.014 and it is significant.

Cross table showing Work of Breathing in study population

Work of Breathing	Saline				Total	P Value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
None	1	2	2	4	3	
Intercostal - Sub sternal	29	58	20	40	49	0.190
Intercostal and supraclavicular	20	40	28	56	48	
Total	50		50		100	

P value is 0.190 and it is not significant, meaning that both groups were comparable in terms of Work of Breathing.

Bar diagram showing Work of Breathing in study population



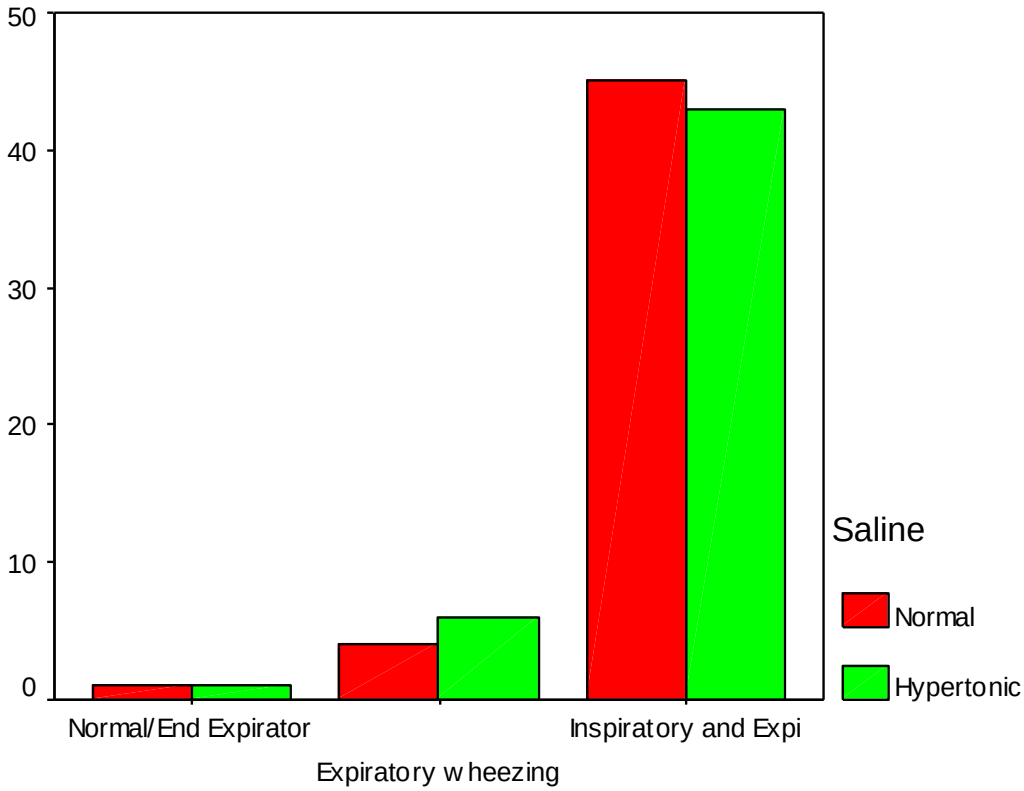
P value is 0.190 and it is not significant. So both groups were comparable in terms of Work of Breathing.

Cross table showing percentage of Breath Sounds in study population

Breath Sounds		Saline				Total	P Value
		Normal		Hypertonic			
		No	Percentage	No	Percentage		
	Normal/End Expiratory wheezing	1	2	1	2	2	0.445
	Expiratory wheezing	4	8	6	12	10	
	Inspiratory and Expiratory	45	90	43	86	88	
Total		50		50		100	

P value is 0.445 and it is not significant, meaning that both groups were comparable.

Bar diagram showing Breath Sounds in study population



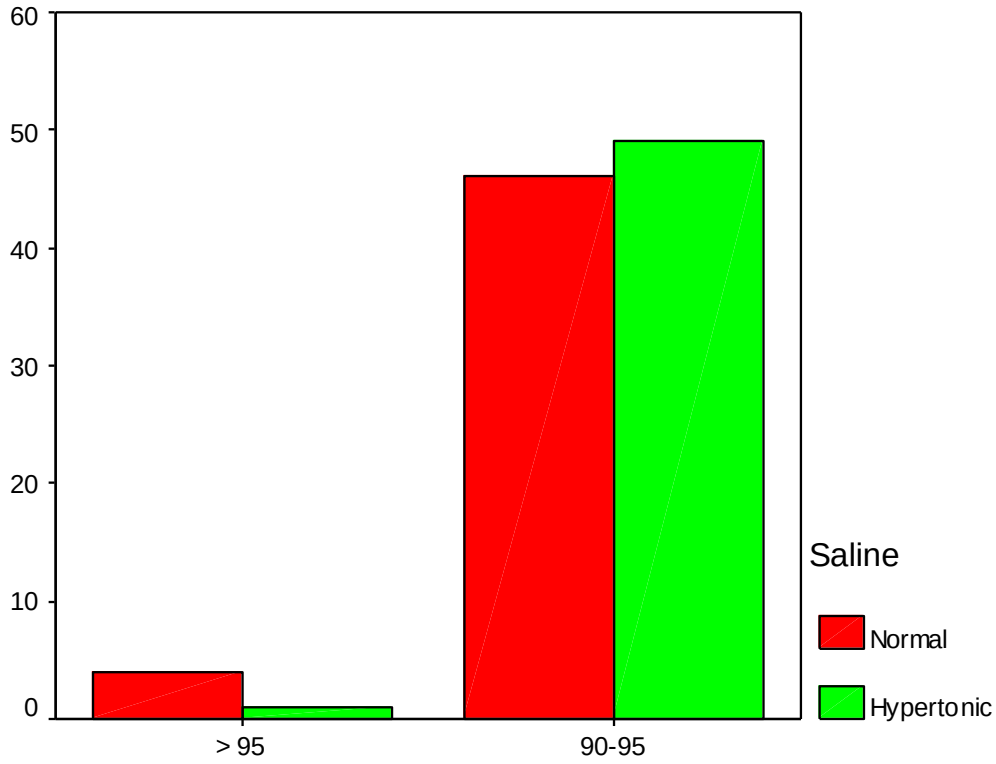
P value is 0.445 and it is not significant, meaning that both groups were comparable in terms of Breath Sounds.

Cross table showing percentage of children with Oxygen Saturation in this study population

SPO2 in %	Saline				Total	P Value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
> 95	4	8	1	2	5	
90-95	46	92	49	98	95	0.169
Total	50		50		100	

P value is 0.169 and it is not significant, meaning that both groups were comparable.

Bar diagram showing percentage of children with Oxygen Saturation in this study population.



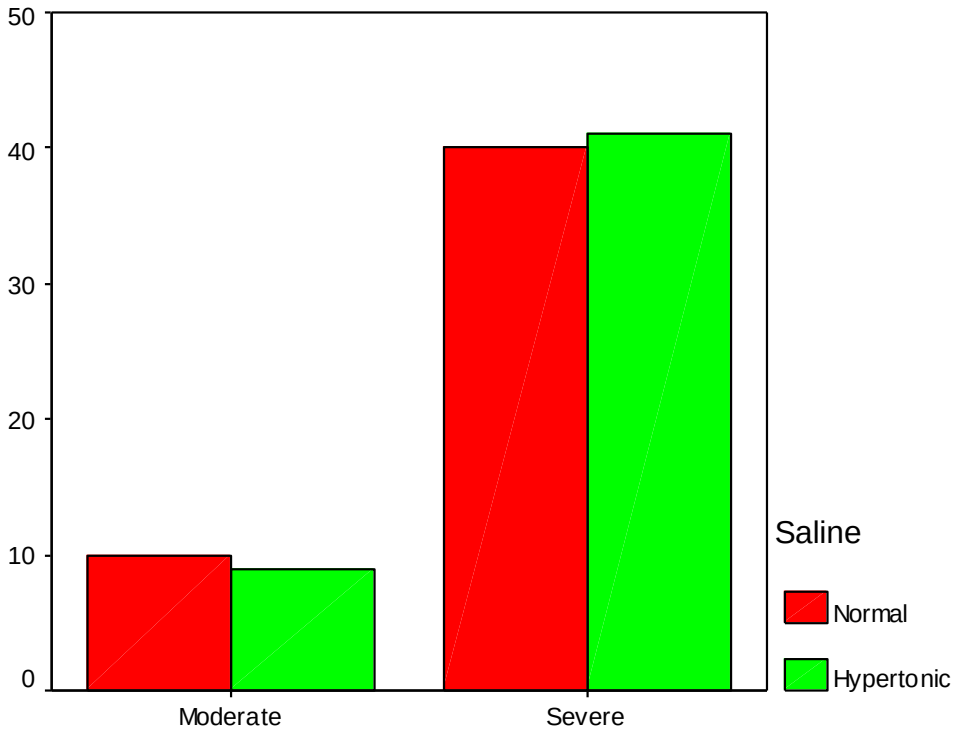
P value is 0.169 and it is not significant. So both groups were comparable.

Cross table showing Base line Score in study population

Base line Score	Saline				Total	P Value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
Moderate	10	20	9	18	19	
Severe	40	80	41	82	81	0.799
Total	50		50		100	

P value is 0.799 and it is not significant. So both groups were comparable.

Bar diagram showing Base line Score in this study population



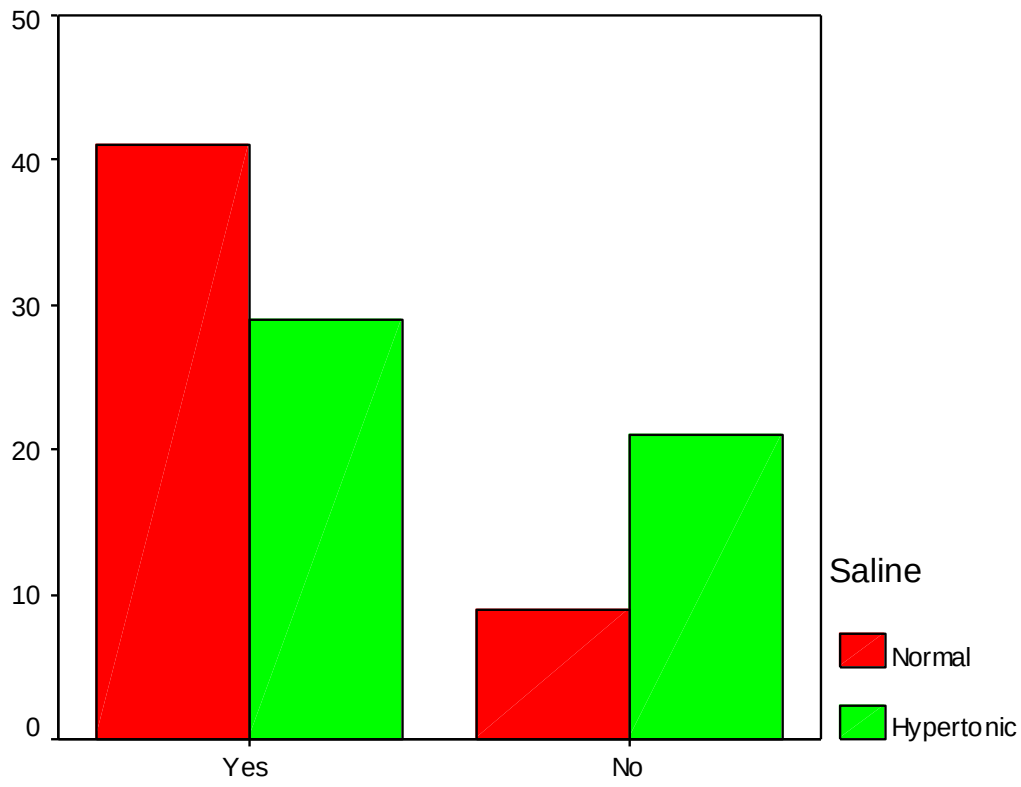
P value is 0.799 and it is not significant, meaning that both groups were comparable in terms of Base line Score.

PRIMARY OUTCOME
Cross table showing Admission Rate in study population

Admission Rate	Saline				Total	P Value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
Admitted	41	82	29	58	70	.009
Not Admitted	9	18	21	42	30	
Total	50		50		100	

P value is 0.009 and it is significant.

Bar diagram showing Admission Rate in study population



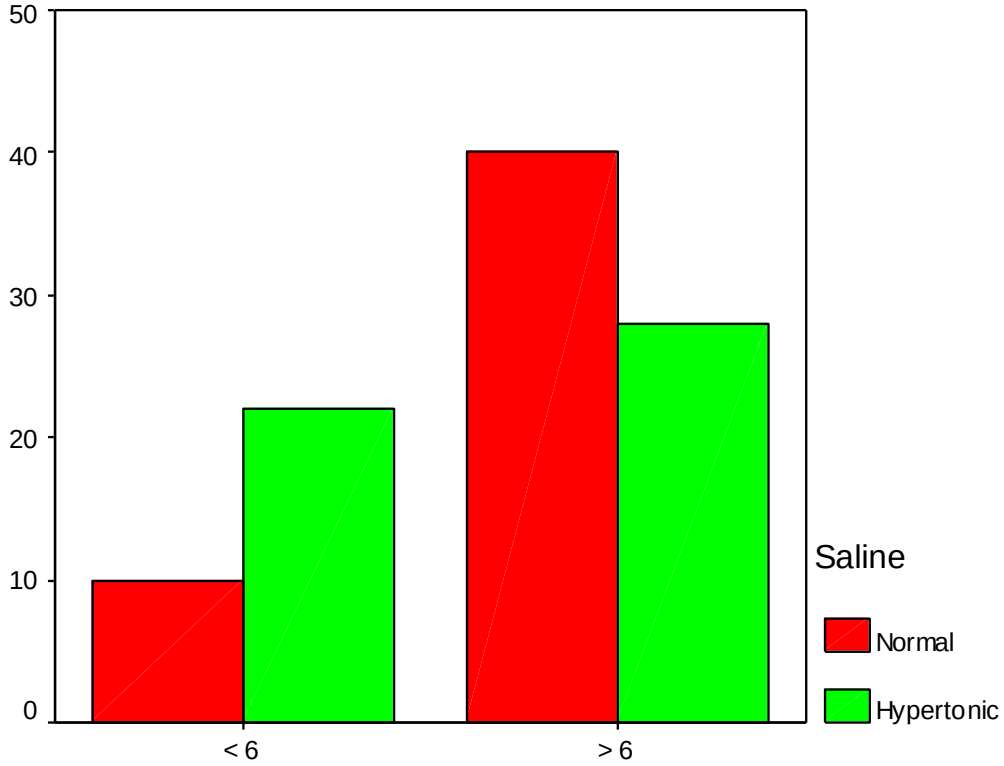
P value is 0.009 and it is significant.

Cross table showing Clinical Severity Score in study population

Clinical Severity Score	Saline				Total	P Value
	Normal		Hypertonic			
	No	Percentage	No	Percentage		
< 6	10	20	22	44	32	
> 6	40	80	28	56	68	
						0.010
Total	50		50		100	

P value is 0.010 and it is significant.

Bar diagram showing Clinical Severity Score in study population



P value is 0.010 and it is significant.

RESULTS

Age:-

In our study children between 2 to 6 years were taken in to analysis. 8 children were in 2 years of age, 28 were in 3 years of age, 45 children were in 4 years of age, 13 were in 5 years of age, and 6 were in 6 years of age.

Majority of children were in 4 years of age group with mean age of 3.81(0.97).

P value was 0.096 and it is not significant, so both groups were comparable in terms of age.

Sex:-

In this study out of 100 children majority of the children were males 61%. 39% were females. In Normal saline group out of 50 children 28 were males, 22 were females.

The P value was 0.305 and it is not significant. So both groups were comparable in terms of sex.

History of Asthma in family:-

Out of 100 children analyzed 50% of the children had family history of Asthma. In Normal saline group 20 children had Family History of Asthma and 30 had no family History of Asthma. In

Hypertonic saline group 30 children had family History of Asthma and 20 had no family History of Asthma.

P value was 0.046 and it is significant.

History of Previous Nebulization's:-

Out of 100 children analyzed 66% had previous history of Nebulization and 34% had no previous history of Nebulization. In normal saline group 72% of children had previous history of Nebulization and 28% did not have previous history of Nebulization. IN hypertonic saline group 60 % had previous history of nebulization.

P value was 0.205 and it is not significant meaning that both groups were comparable in terms of previous history of Nebulization.

Respiratory Rate:-

Out of 100 children analyzed 9% of the children had Respiratory Rate between 31 to 35 per minute. 91% had Respiratory Rate of more than 35 per minute. In normal saline group out of 50 children only one child had Respiratory Rate between 31 to 35 per minute. 49 children had Respiratory Rate of more than 35 per minute.

In Hypertonic saline group 8 children had Respiratory Rate between 31 to 35 per minute, 42 children had Respiratory Rate of more than 35 per minute.

P value was 0.014 and it is significant.

Work of Breathing:-

Out of 100 children 3% of children had no retractions, 49% had intercostal / sub sternal retractions. 48% had intercostal and supra clavicular retractions.

In normal saline group 1 child had no retractions, 29 children had intercostal / sub sternal retractions and 20 children had intercostal / supra clavicular retractions. In hypertonic saline group 2 had no retractions , 20 had inter costal or sub sternal retractions , 28 had inter costal and supra clavicular retractions.

P value was 0.190 and it is not significant. So both groups were comparable in terms of Work of Breathing.

Breath Sounds:-

Out of 100 children 2% had Normal or end Expiratory Wheezing. 10% had Expiratory Wheezing, 88% had Inspiratory and expiratory wheezing.

In normal saline group one child had normal or end expiratory wheezing, 4 had expiratory wheezing and 45 had inspiratory and expiratory wheezing.

In hypertonic saline group one child had normal or end expiratory wheezing, 6 had expiratory wheezing, and 43 had inspiratory and expiratory wheezing.

P value was 0.445 and it is not significant, meaning that both groups were comparable in terms of breath sounds.

SPEECH: All children were able to speak in short sentences

Oxygen saturation:-

Out of 100 children only 5% of children had oxygen saturation of more than 95%. 95% of children had oxygen saturation between 90 to 95%.

In normal saline group 4 children were had oxygen saturation of more than 95%. 46 children were had oxygen saturation between 90 to 95%.

In Hypertonic saline group 1 child had oxygen saturation of more than 95%. 49 children were had oxygen saturation between 90 to 95%.

P value was 0.169 and it is not significant meaning that both groups were comparable in terms of oxygen saturation.

Base line score:-

Out of 100 children none of them had mild Base line score. 19% of the children had moderate Base line score. 81% had severe Base line score. In normal saline group 10 children had moderate Base line score and 40 children had severe Base line score.

In Hypertonic saline group 9 children had moderate Base line score and 41 children had severe Base line score.

P value was 0.799 and it is not significant meaning that both groups were comparable in terms of Base line score.

Admission rate:-

Out of 100 children 70% were admitted and 30% were not admitted. In normal saline group 41(82%) children were admitted and 9(18%) children were not admitted.

In Hypertonic saline group 29(58%) children were admitted and 21(42%) children were not admitted.

P value was 0.009 and it is significant. So both groups were comparable in terms of admission rate.

Risk difference:-

The admission rate in normal saline group was 82% and that in hypertonic saline was 58%.

The Risk difference in admission rate was 24% with a 95 % confidence interval of 6 to 40%.

Clinical severity score:-

Out of 100 children analyzed 32% of the children had clinical severity score of less than 6 and 68% had clinical severity score of more than 6.

In normal saline group 10(20%) had clinical severity score of less than 6 and 40 children were had clinical severity score of more than 6.

In hypertonic saline group 22 children (44%) had clinical severity score of less than 6 and 28 children (56%) had clinical severity score of more than 6.

P value was 0.010 and it is significant.

Adverse effect:-

Out of 100 children none of them had any adverse effect. Hypertonic saline may cause bronchospasm but it depends upon the volume and the concentration of the saline used.

When the concentration and volume of the saline increases there is more chance of bronchospasm. In this study less concentration (3%) and less volume (3.5ml) of saline was used along with a bronchodilator. so no adverse effects have been noted during the study.

DISCUSSION

The study was done on 100 patients with 50 in Hyper tonic saline group and 50 in Normal saline group.

The mean (50) age was 3.81(0.97) with maximum patients (45%) of age 4. Sex ratio was 61:39 with male preponderance. Half of the patients had positive family history while 66% were nebulized in past.

91% had respiratory rate more than 35 while 9% had respiratory rate between31-35. 48% had intercostal and supraclavicular retractions while 49% had intercostal and sub sternal retractions and only 3% had no retractions. 88% had wheezing heard in both phases of respiration while 10% had only expiratory wheezing and 2% had just end expiratory wheezing. 95% had oxygen saturation between 90 to 95% while only 5% had between above 95%. All of them were able to speak in short sentences. Overall as per baseline score 81% had severe respiratory distress and 19% had moderate respiratory distress.

Out of 100 patients, 70 were admitted, admission rate being 70%. Post nebulization clinical severity score was <6 in 32%. None of patients were noted to have any adverse events in either of group.

Both groups were comparable in terms of baseline parameters like ages sex, family history of asthma and previous history of nebulisations.

Normal saline group had more number of patients with respiratory rate >35 than the hypertonic saline group. But, other variables of scoring like work of breathing, oxygen saturation, auscultatory findings and speech were comparable in both the groups. The overall baseline clinical severity scoring was comparable in both treatment groups.

The admission rate in hypertonic saline group (58%) was less than that in normal saline group (82%) and the difference was statistically significant (p-0.009). The risk difference was 24% and its 95% confidence interval was (6 to 40%).

Post nebulization clinical severity score less than 6 was found in 20% in normal saline group and 44% in hypertonic saline group which was also statistically significant (p=0.01). Thus more patients improved after hypertonic saline nebulization compared to normal saline nebulization.

Thus our study clearly indicates that hypertonic saline is superior to normal saline as a vehicle for salbutamol nebulization in preschool children with acute wheezing.

This is in concordance with study done by Dorit Ater et al which reported a 30% reduction in admission rate following hypertonic saline as compared to normal saline nebulization.

Though hypertonic saline is not a mucolytic per se, it is capable of disintegrating ionic bonds within mucous gel and decreasing cross linkages and thus improves mucus clearance. Thus hypertonic saline is superior to normal saline in causing resolution of clinical symptoms.

LIMITATIONS

In our study, the respiratory rate in baseline clinical severity scoring was not comparable and had statistically significant difference between both treatment groups with severe patients in normal saline group.

However no such difference was observed in other variables of score as well as overall score making both the groups comparable.

Randomization was not done and alternate patients were allotted to either group. But this did not result in significant bias as most baseline parameters were comparable in both groups.

Blinding was not done which could have resulted in observer bias.

Past and present history of oral medications was not taken into considerations for analysis. This could have an effect on outcome measured.

RECOMMENDATIOINS

Hypertonic saline can be preferred over normal saline as a vehicle for salbutamol nebulization in preschool wheezing.

Further double blinded randomized control trial taking drug history into considerations to be done to prove the superiority of hypertonic saline over normal saline.

CONCLUSION

Hypertonic saline is superior to normal saline as a vehicle for salbutamol nebulization in decreasing admission rate and improving asthma severity score.

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INFORMED CONSENT FORM

Study place: INSTITUTE OF CHILD HEALTH AND HOSPITAL FOR CHILDREN, medical opd.

Title of the study: EFFICACY OF 3% HYPERTONIC SALINE WITH SALBUTAMOL IN ACUTE WHEEZING IN CHILDREN AGED 2-6YEARS ATTENDING A TERTIARY CARE HOSPITAL.

Name of the investigator: **Dr.B.THIRUMOORTHY.**

Name of the Participant: Age: Sex:

Hospital number:

1. I have read and understood this consent form and the information provided to me regarding the participation in the study.

2. I have had the consent document explained to me.

3. I have been explained about the nature of the study.

4. I have been explained about my rights and responsibilities by the investigator.

5.I will allow my child to undergo nebulisation and investigations if needed, during the study whole heartedly.

6. I have informed the investigator of all the treatments I am taking or have taken in the past including any native (alternative) treatment.

7. I have been advised about the risks associated with my participation in this study.*

8. I agree to cooperate with the investigator and I will inform him/her immediately if I suffer unusual symptoms. *

9. I have not participated in any research study in the past.

10. I am aware of the fact that I can opt out of the study at any time without having to give any reason and this will not affect my future treatment in this hospital. *

11. I am also aware that the investigator may terminate my participation in the study at any time, for any reason, without my consent. *

12. I hereby give permission to the investigators to release the information obtained from me as result of participation in this study to the sponsors, regulatory authorities, Govt. agencies, and IEC. I understand that they are publicly presented.

13. I have understand that my identity will be kept confidential if my data are publicly presented

14. I have had my questions answered to my satisfaction.

15. I have decided to be in the research study.

I am aware that if I have any question during this study, I should contact the investigator. By signing this consent form I attest that the information given in this document has been clearly explained to me and understood by me, I will be given a copy of this consent document.

Name and signature / thumb impression of the parents/guardian

Name _____ Signature_____ Date_____

Name and Signature of impartial witness:

Name _____ Signature_____ Date_____

Name and Signature of the investigator or his representative obtaining consent:

Name _____ Signature_____ Date_____

INFORMATION SHEET

Place of study: INSTITUTE OF CHILD HEALTH AND HOSPITAL FOR CHILDREN, medical opd.

Name of Investigator : **DR.B.THIRUMOORTHY,**

Name of Participant age: sex:

Hospital No:

Study title : **EFFICACY OF 3% HYPERTONIC SALINE WITH SALBUTAMOL IN ACUTE WHEEZING IN CHILDREN AGED 2-6 YEARS ATTENDING A TERTIARY CARE HOSPITAL** .

• We are conducting a study on **EFFICACY OF 3% HYPERTONIC SALINE WITH SALBUTAMOL IN ACUTE WHEEZING IN CHILDREN AGED 2-6 YEARS ATTENDING A TERTIARY CARE HOSPITAL .**

We request you to participate in the study

• To assess EFFICACY OF 3% HYPERTONIC SALINE WITH SALBUTAMOL IN ACUTE WHEEZING IN CHILDREN AGED 2-6 YEARS in our hospital.

• The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

• Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

• The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of investigator, Signature of parent/guardian,

Date:

தகவல் படிவம்

ஆய்விடம்: அரசினர் குழந்தைகள் நலமருத்துவமனை, எழும்பூர், சென்னை-600008.

ஆய்வாளர்: மருத்துவர் ப.திருமூர்த்தி

பங்குபெறுபவரின் பெயர்: **வயது:** **பாலினம்:**

மருத்துவமனை எண் **மாதிரியின் எண்:**

ஆய்வு தலைப்பு: : இரண்டு முதல் ஆறு வயது வரை உள்ள மூச்சிரைப்பு உள்ள குழந்தைகளில் 3% ஹைப்பர்டானிக் சலைனுடன் சால்புட்டமாலின் செயல்திறன் பற்றிய ஆய்வு

தங்கள் குழந்தையும் இந்த ஆய்வில் பங்குபெற கேட்டுகொள்கின்றோம்.

1..

2. உங்கள் குழந்தையைப் பற்றிய தனிப்பட்ட விவரங்கள் யாருக்கும் தெரிவிக்காமல் பாதுகாக்கப்படும்.

3. இந்த ஆய்வில் பங்கு பெறுவது உங்கள் தனிப்பட்ட விருப்பமே. ஆய்வு ஆரம்பித்தபின் விருப்பம் இல்லை என்றால் தாங்கள் விலகிக்கொள்ளலாம். அவ்வாறு விலகுவதானது தங்கள் குழந்தையின் சிகிச்சைக்கு எவ்வித பாதிப்பையும் உருவாக்காது.

4. ஆய்வின் முடிவுகள் ஆய்வு நடக்கும்போதோ(தேவை ஏற்படின்) அல்லது ஆய்வு முடிந்த பின்னரோ தங்களுக்கு தெரிவிக்கப்படும். அந்த முடிவுகள் தங்கள் குழந்தையின் சிகிச்சைக்கு பேருதவியாக இருக்கக்கூடும்.

ஆய்வாளரின் கையொப்பம் பெற்றோரின் கையொப்பம்

நாள்

இடம்

ஒப்புதல் படிவம்

1. இந்த ஆய்வைப்பற்றிய அனைத்து தகவல்களும் எனக்கு தெரிவிக்கப்பட்டது.
2. இதில் பங்குபெறுவதற்கான ஒப்பந்த படிவமும் எனக்கு விவரிக்கப்பட்டது.
3. ஆராய்ச்சியின் தன்மையும், எனது உரிமைகளும் எடுத்துரைக்கப்பட்டது .
4. இந்த ஆய்வினால் எனது குழந்தையின் நலனுக்கு எந்த தீங்கும் இல்லை என்பதை தெரிந்து கொண்டேன்.
5. இந்த ஆய்வில் எனது குழந்தை பங்குபெற எனது மனமார்ந்த ஒப்புதலை தருகிறேன்.

பெற்றோரின் கையொப்பம்: சாட்சியின் கையொப்பம்.

ஆய்வாளரின் கையொப்பம்

தேதி

இடம்

PROFORMA

1.	**PATIENT NAME**	**SEX 1.MALE 2.FEMALE**
2.	**AGE**	**DATE MMYY**
3.	**OP NO;**	**FATHERS NAME ;** **MOTHERS NAME;**
4.	**ADDRESS;**	**1.CHENNAI CITY 2.OTHERS.**
5.	**H/O BREATHLESNESS**	**1.YES 2.NO** **DURATION**
6.	**H/O CHEST RETRACTIONS**	**1.YES 2.NO**
7.	**H/O CYANOSIS**	**1.YES 2.NO**

8.	**H/O NOISY BREATHING**	**1.YES 2.NO** **DURATION**
9.	**H/O REFUSAL OF FEEDS**	**1.YES 2.NO** **DURATION**
10.	**H/O VOMITING**	**1.YES 2.NO** **DURATION**
11.	**H/O IMMUNISATION**	**1.UPTO AGE 2.NOT UPTO AGE** **3.UNIMMUNISED 4.NOT KNOWN**
12.	**SOCIO ECONOMIC STATUS** **MODIFIED KUPPUSAMY SCALE**	

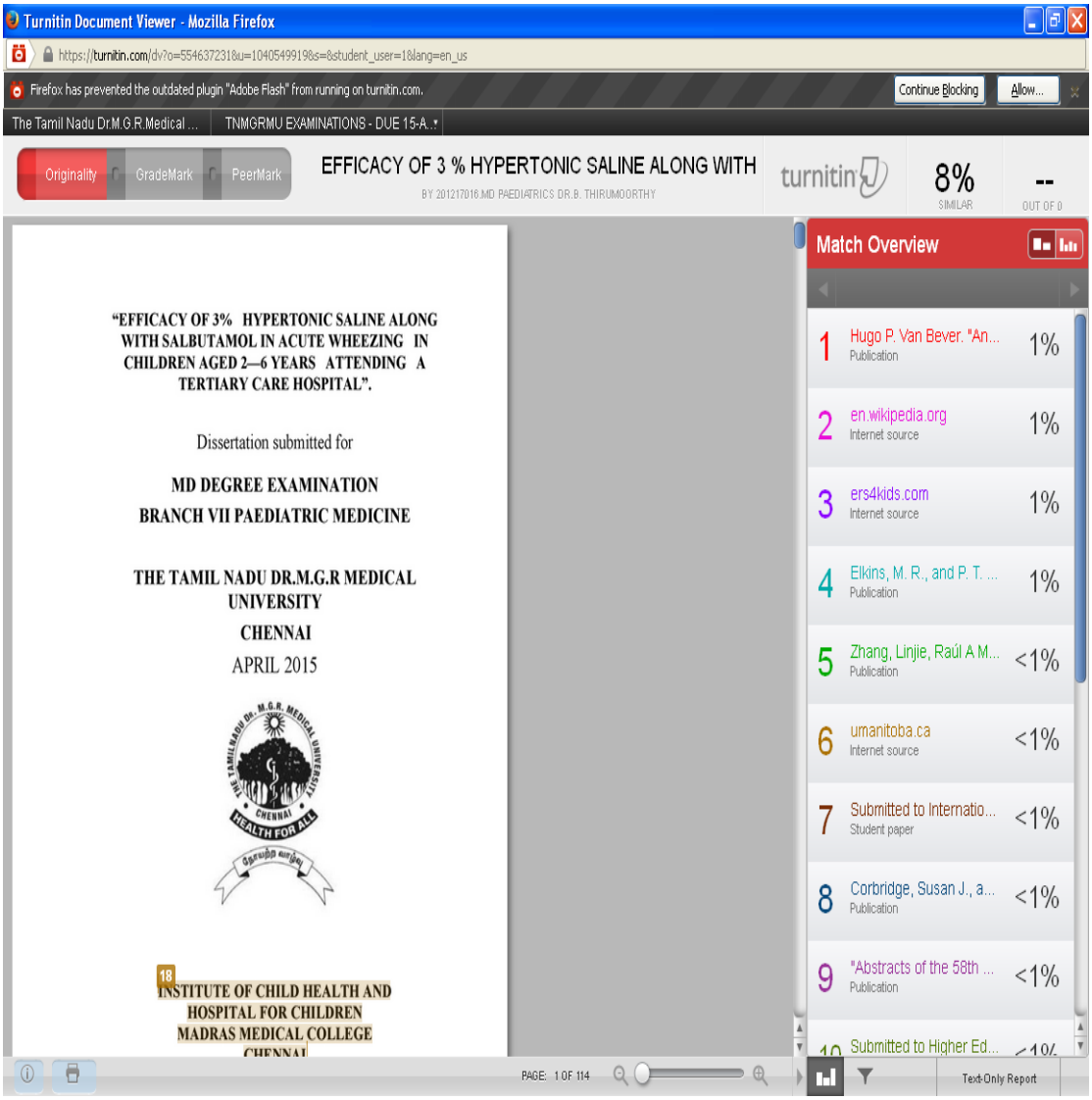
<u>PAST HISTORY</u>

13.	**H/O ASTHMA**	
14.	**H/O PREVIOUS NEBULISATION**	
15.	**H/O HOSPITALISATION**	**1.YES 2.NO**

EXAMINATION

16.	**WEIGHT**	**HEIGHT**
17.	**SENSORIUM**	**1.NORMAL** **2.ALTERED**
18.	**NUTRITIONAL STATUS**	
19.	**VITALS**	**PULSE BP:**
20.	**RESPIRATORY RATE**	
21.	**WORK OF BREATHING**	**1.GRUNT 2.STRIDOR 3.RETRACTIONS**
22.	**TRACHEAL POSITION**	**1. MIDLINE 2.RIGHT . 3. LEFT.**
23.	**BREATH SOUNDS**	
24.	**SPO2**	
25.	**CVS**	
26.	**ABDOMEN**	
27.	**CNS**	

28.	**Humidified Oxygen Administration**	**1.Yes 2.No**
29.	**Nebulized 3% hypertonic saline with salbutamol (3 doses)**	**1.Yes 2.No**
30.	**Nebulized with0.9% saline with salbutamol (3 Doses)**	**1.Yes 2.No**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Dissertation submitted for
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THE TAMIL NADU DR.M.G.R MEDICAL UNIVERSITY
CHENNAI
APRIL 2015
INSTITUTE OF CHILD HEALTH AND HOSPITAL FOR CHILDREN MADRAS MEDICAL COLLEGE
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CHENNAI

APRIL 2015

INSTITUTE OF CHILD HEALTH AND HOSPITAL FOR CHILDREN MADRAS MEDICAL COLLEGE CHENNAI

MASTER CHART- NORMAL SALINE GROUP

S.NO	NAME	AGE	SEX	OP NO	BREATHLESSNESS	CHEST RETRACTIONS	CYANOSIS	NOISY BREATHING	H/O ASTHMA IN FAMILY	H/O PREVIOUS NEBULISATIONS	SENSORIUM	MURMUR	RESPIRATIRY RATE	WOB	BREATH SOUNDS	SPO2	SPEECH	BASELINE SCORE	OXYGEN	NEBULISATION	ADMISSION RATE	CLINICAL SEVERITY SCORE	ADVERSE EFFECTS
1	SARANYA	4	2	1309	1	1	2	2	2	2	1	2	3	3	3	2	2	3	1	2	2	1	2
3	KARPAGAM	4	2	1412	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	2	1	2	2
5	MANIVANNAN	4	1	1426	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	1	2	2
7	KANNAN	5	1	1482	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	1	2	2
9	VAISHNAVI	4	2	1582	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	1	2	2
11	MALAR	4	2	1108	1	1	2	2	2	1	1	2	3	2	3	1	2	2	1	2	1	2	2
13	MANJULA	3	2	1110	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	2	1	2	2
15	MENAKA	4	2	1126	1	1	2	2	2	1	1	2	3	2	3	1	2	2	1	2	1	2	2
17	SHERLYN	4	2	1232	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	2	1	2	2
19	PADMAPRIYA	4	2	1021	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	1	2	2
21	MONESH	2	1	1262	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	2	1	2	2
23	JAYALAKSHMI	4	2	1478	1	1	2	2	2	2	1	2	3	2	3	2	2	3	1	2	1	2	2
25	LALITHA	4	2	1462	1	1	2	2	1	1	1	2	3	2	3	2	2	3	1	2	2	1	2
27	VENKATESH	4	1	1724	1	1	2	2	2	1	1	2	2	2	3	2	2	3	1	2	1	2	2
29	NIRAJKUMAR	4	1	1644	1	1	2	2	1	2	1	2	3	2	3	1	2	2	1	2	1	2	2
31	DHILIP	4	1	1241	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	1	2	2
33	USHA	4	2	1538	1	1	2	2	2	2	1	2	3	2	2	2	2	2	1	2	1	2	2
35	YUVANRAJA	3	1	1432	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	2	1	2	2
37	VAISHALI	2	2	1892	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	2	1	2	2

39	SHAKTHIVEL	5	1	2921	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	2	1	2
41	SANTHOSH	5	1	1991	1	1	2	2	1	1	1	2	3	3	1	2	2	2	1	2	1	2	2
43	SHRAVANTH	3	1	1758	1	1	2	2	2	1	1	2	3	2	2	2	2	2	1	2	1	2	2
45	JAVID	6	1	1765	1	1	2	2	2	1	1	2	3	2	2	2	2	2	1	2	1	2	2
47	LOGESH	6	1	1775	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	1	2	2
49	SOORYA	5	1	1781	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	2	2	1	2
51	THENNARASU	3	1	1785	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	1	2	2
53	AKASH	4	1	1795	1	1	2	2	2	1	1	2	3	1	3	2	2	2	1	2	1	2	2
55	HARISHJAI	3	1	1789	1	1	2	2	1	1	1	2	3	2	3	2	2	3	1	2	1	1	2
57	MARLIYA	5	2	1722	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	2	1	2	2
59	ANUSIYA	4	2	1524	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	2	2	1	2
61	BALAMURALI	4	1	1695	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	2	1	2	2
63	VELAMMAL	4	2	1340	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	2	1	2	2
65	RAJESH	4	1	1588	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	2	1	2	2
67	JAISAIRAM	2	1	1694	1	1	2	2	1	1	1	2	3	2	3	2	2	3	1	2	2	1	2
69	GOPINATH	6	1	1711	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	2	1	2	2
71	BALAMURUGAN	5	1	1710	1	1	2	2	1	2	1	2	3	2	3	2	2	3	1	2	2	1	2
73	MADAVAN	3	1	1780	1	1	2	2	2	2	1	2	3	2	3	2	2	3	1	2	1	2	2
75	BRINDHA	5	2	1790	1	1	2	2	1	2	1	2	3	2	3	2	2	3	1	2	1	2	2
77	SHANTHI	4	2	1806	1	1	2	2	1	2	1	2	3	2	3	2	2	3	1	2	1	2	2
79	GURUCHANDIRAN	5	1	1012	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	2	1	2	2
81	KALAIARASI	3	2	1644	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	2	1	2	2
83	GURU	2	1	1704	1	1	2	2	2	1	1	2	3	3	2	2	2	3	1	2	1	2	2
85	PADMA	3	2	1723	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	2	1	2	2

87	DEVI	5	2	1401	1	1	2	2	1	2	1	2	3	2	3	2	2	3	1	2	1	2	2
89	ABDHULJA FAR	4	1	1727	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	2	2	1	2
91	VISHAL	3	1	1893	1	1	2	2	1	1	1	2	3	2	3	2	2	2	1	2	2	1	2
93	POONGODI	4	2	1895	1	1	2	2	1	1	1	2	3	2	3	2	2	3	1	2	1	2	2
95	SOWMIYA	4	2	1897	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	1	2	2
97	VIJAYARUN	4	1	1988	1	1	2	2	2	1	1	2	3	2	3	1	2	2	1	2	1	2	2
99	RAMU	3	1	1422	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	2	1	2	2

HYPERTONIC SALINE GROUP

S.NO	NAME	AGE	SEX	OP NO	BREATHLESSNESS	CHEST RETRACTIONS	CYANOSIS	NOISY BREATHING	H/O ASTHMA IN FAMILY	H/O PREVIOUS NEBULISATIONS	SENSORIUM	MURMUR	RESPIRATIRY RATE	WOB	BREATH SOUNDS	SPO2	SPEECH	BASELINE SCORE	OXYGEN	NEBULISATION	ADMISSION RATE	CLINICAL SEVERITY SCORE	ADVERSE EFFECTS
2	MEENAKSHI	4	2	1344	1	1	2	2	2	2	1	2	3	3	3	2	2	3	1	1	2	1	2
4	EASWARAN	3	1	2142	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	1	1	2	2
6	KASTURI	4	2	1304	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	1	1	2	2
8	SHALINI	3	2	1342	1	1	2	2	1	1	1	2	2	2	3	2	2	2	1	1	1	2	2
10	NASEEMABANU	4	2	972	1	1	2	2	1	1	1	2	3	2	2	2	2	2	1	1	2	1	2
12	NIJAMUDEEN	6	1	1108	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	1	1	2	2
14	MANOHAR	5	1	1112	1	1	2	2	2	2	1	2	3	2	3	2	2	2	1	1	1	2	2
16	KANNADAS	5	1	2194	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	1	1	2	2
18	SETHUPATHI	4	1	1260	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	1	2	1	2
20	PUSHPARAJ	3	1	962	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	1	2	1	2
22	KRISHNA	3	1	1490	1	1	2	2	2	2	1	2	3	2	3	2	2	3	1	1	1	2	2
24	JOSEPH	3	1	1714	1	1	2	2	2	2	1	2	3	2	3	2	2	3	1	1	1	2	2
26	MUTHU	3	1	1625	1	1	2	2	2	1	1	2	3	2	2	2	2	2	1	1	1	2	2
28	KAMARAJ	5	1	1633	1	1	2	2	1	1	1	2	3	2	3	2	2	3	1	1	1	2	2
30	PADMARAJ	3	1	1242	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	1	2	1	2
32	POORNIMA	3	2	1632	1	1	2	2	1	1	1	2	3	2	3	2	2	3	1	1	1	2	2
34	MERLIN	4	2	1362	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	1	1	2	2
36	KALAIVANI	4	2	1898	1	1	2	2	2	1	1	2	3	3	3	2	2	3	1	1	2	1	2
38	PRASANTH	3	1	1746	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	1	2	1	2
40	VISHWA	2	1	1912	1	1	2	2	2	1	1	2	2	2	2	2	2	2	1	1	1	2	2

42	YOGESH	3	1	1999	1	1	2	2	2	1	1	2	2	3	3	2	2	3	1	1	1	2	2
44	JAISHAKTHI	6	1	1770	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	1	1	2	2
46	VARUNKUMAR	5	1	1776	1	1	2	2	1	1	1	2	2	2	3	2	2	3	1	1	1	1	2
48	GOMATHI	4	2	1782	1	1	2	2	2	1	1	2	2	3	2	2	2	3	1	1	2	1	2
50	NARESH	3	1	1787	1	1	2	2	2	1	1	2	2	3	3	2	2	3	1	1	2	1	2
52	SANTHOSH	4	1	1794	1	1	2	2	1	1	1	2	2	1	3	2	2	2	1	1	1	2	2
54	VARSHINI	2	2	1690	1	1	2	2	1	2	1	2	2	2	2	2	2	2	1	1	1	2	2
56	INIYAN	4	1	1701	1	1	2	2	2	2	1	2	3	2	3	2	2	3	1	1	1	2	2
58	FATHIMA	3	2	1744	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	2	1	2
60	SHANMUGAM	3	1	1344	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	2	1	2
62	JOHNSON	4	1	1536	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	1	2	1	2
64	JANARDANAN	3	1	1592	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	1	1	2	2
66	SRIRANGAN	3	1	1596	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	2	1	2
68	YUVEDA	6	2	1697	1	1	2	2	1	2	1	2	3	1	3	2	2	2	1	1	1	2	2
70	PUSHPA	4	2	1732	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	1	1	2	2
72	BHARANIKUMAR	2	1	1824	1	1	2	2	2	2	1	2	3	2	1	2	2	2	1	1	1	2	2
74	VASUKI	4	2	1444	1	1	2	2	1	1	1	2	3	3	2	2	2	3	1	1	1	2	2
76	VASANTHKUMAR	3	1	1802	1	1	2	2	1	1	1	2	3	2	3	2	2	3	1	1	2	1	2
78	PANDIYARAJ	4	1	1784	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	2	1	2
80	KARTHICK	4	1	1764	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	2	1	2
82	RAMACHANDIRAN	4	1	1622	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	1	2	2
84	SHAKTHIKUMAR	4	1	1707	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	2	1	2
86	DHANUSH	4	1	1722	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	2	1	2
88	ANJALI	3	2	1726	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	2	1	2
90	ASHOK	4	1	1687	1	1	2	2	2	1	1	2	3	2	3	2	2	3	1	1	1	2	2
92	ARUL	2	1	1729	1	1	2	2	1	1	1	2	3	3	3	2	2	3	1	1	2	1	2

94	JOSHNA	3	2	1892	1	1	2	2	2	2	1	2	3	3	3	1	2	3	1	1	1	2	2
96	POOVARASAN	4	1	1898	1	1	2	2	1	1	1	2	3	2	3	2	2	3	1	1	1	2	2
98	VIYAJARANI	4	2	1822	1	1	2	2	1	2	1	2	3	3	3	2	2	3	1	1	2	1	2
100	MANIMEGALAI	4	2	1894	1	1	2	2	1	2	1	2	3	2	3	2	2	3	1	1	1	2	